PHILADELPHIA WATER DEPARTMENT

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"Misc. historical information [related to Philadelphia water supply] ca. 1889-1930" folder. Includes several 1889 articles on typhoid fever, with letters from Thomas Meehan; city solicitor opinions; reports from Charles M. Cresson and Samuel C. Hooker on the purity of the Philadelphia water supply; article from 1916 relating to water waste and filtration.

Ca. 1889-1930.

Sunday Mercury

PHILADELPHIA, OCTOBER 13, 1889.

# OUR ILLUSTRATIONS.

## THE EAST PARK RESERVOIR.

### The Formal Transfer to the City of the Last Section.

In the presence of the Mayor, members of City Councils, heads of the departments and bureaus and other city officials, Messrs. Filbert and Porter, contractors, on Tuesday last formally delivered to the city the third and last section of the great East Park Reservoir. The day was made the occasion of an unusual demonstration, terminating with a banquet in St. George's Hall, where a dozen brief speeches were made.

The delegation left Broad Street Station at 2.45 o'clock in a special train and reached Engleside Station, near the reservoir, a few minutes later. In the party were Mayor Fitler, Collector Thomas V. Cooper, William H. Gray, Richard Oellers, George F. Payne, Allen B. Rorke, J. E. Reyburn, [illegible] Dobson, John Mundell, W. [illegible] Hale, Alfred Huffnagle, J. E. Davidson, John Ord, Stacy Reeves, W. L. Elkins, Jr., George C. Hulme, Boies Penrose, Samuel C. Perkins, George G. Pierie, Isaac A. Sheppard, Col. [illegible] P. Dechert, Clayton McMichael, Addison Hutton, John Hay, George Harding, William B. Gill, Hamilton Disston, H. W. Day, Frank Furness, Richard Peltz, Edward A. Pue, Dr. T. H. Andrews, Col. O. C. Bosbyshell, William Brice, Charles W. Henry, Coroner Ashbridge, Thomas Gaskill, Mahlon H. Dickinson, G. W. Hewitt, J. H. Windom, H. S. Thompson, Edwin Hazlehurst, Charles E. Johnson, H. L. Crawford, Jacob Myers, Charles H. Fletcher, Amos J. Bowden, Thomas H. Gill, J. L. Hoppock, Allen Evans, John L. Hill, John Lamon, James W. Sayre, Chief Engineer Smedley of the Survey Department, City Treasurer John Bardsley, H. M. Fuller, A. M. Zane, James S. Watson, William K. Park, E. C. Markley, Gen. William J. Latta, William R. Leeds, F. R. Marshall, T. P. Laisdale, F. R. Marshall, David Martin, Frank W. Murphy, J. W. Reeves, C. F. Robinson, Benjamin Ketcham, Miles King, R. G. Kennedy, [illegible] M. Hales, J. R. Harris, Sam[illegible] Hinkle, W. L. Hewitt, Thomas Grant, William Getty, Thomas Garber, G. W. Fox, A. J. Fetterolf, D. L. Fisher, F. W. Eldridge, A. H. Pingee, J. [illegible] Doyle, T. P. Chandler, Gideon Clark, P. E. Bell, E. Brainard, William Allen, R. S. Beatty, W. H. Wright, J. M. Wilson, Thomas J. Stewart, J. A. P. Moorhead, Jacob Lang, Robert Laughlin, William Brice, Thomas George, Jacob Wildemore, Isaac S. Cassin, J. W. Frazier, A. M. Beitler, Robert Alexander, W. C. McPherson, Howard Perkins, Thomas Gaskill and many more. About four hundred and fifty persons attended the banquet.

They reached the reservoir and walked down a stairway to the bottom, where an informal inspection was made and a photograph take by a MERCURY artist of the entire party.

Director Wagner had the water turned into the new basin from the finished sections. At first there was a slow dripping from the four forty inch conduits, and then, with the valves open wide, the water poured into the section with a Niagara like roar.

The three reservoirs are known as the south, northeast and western basins, the latter being the last. The first, completed in 1887, holds 162,000,000 gallons and cost about $100,000. The second, completed in 188[illegible] holds 310,000,000 gallons and cost $[illegible]25,000. The section just finished, with a capacity of 320,000,000 gallons, cost about $350,000. With the increase of capacity the cost has relatively diminished. There are now in all ten reservoirs or basins, with an aggregate capacity of nearly 900,000,000 gallons, whereas two years ago the whole water supply capacity of the city was only about 180,000,000, or less than one fourth.

The three sections are a mile and a half in circumference, and are each on the basis of 136 feet above the city datum, or highest recorded tide. They are intended to be 30 feet deep perpendicular and 54 feet on the slope.

The East Park reservoir was begun in 1874 and after over $1,000,000 had been squandered the scandals about the work became so notorious that Councils refused to furnish any more money. For many years nothing was done, but shortly after the inauguration of Mayor Fitler he presented plans to Councils for utilizing the immense reservoirs as storage basins. Vast sums of money have been appropriated since then, and although two of the basins have been in use for over a year, they do not seem to improve the city's water, as after every heavy rain a coffee-colored liquid is furnished Philadelphia for cooking and drinking purposes.

The Philadelphia Record. Sunday, June 23 1889.

# THE RAVAGES OF FEVER

## AN ATTEMPT TO LEARN THE CAUSE OF THE DISEASE.

### The Official Investigation in the Northeastern Section of the City Begun—Talk of a Town Meeting.

The official investigation into the causes of the typhoid fever epidemic in the northeastern section of the city began yesterday under the supervision of Port Physician Randle. The doctor arrived at noon from the Lazaretto, where he has been acting for a couple of days for the Lazaretto physician. Dr. Randle stated yesterday that he would made analyses of the water and study the general locality and the premises where the fever exists. He would begin work at once, and his investigations would probably extend over a period of several weeks.

Although returns to the Health Bureau indicate a falling off in the number of typhoid fever cases in the city, the experience of past years teaches that it is but a temporary cessation, and fears are entertained that the next week will mark a decided increase that will continue for months. The records of the past year show that the number of cases of the fever during the past two weeks—153—is 60 in excess of the corresponding period last year, when there were but 93 cases.

#### A DECEPTIVE FALLING OFF.

There was a marked falling off at the end of June, but by the middle of July the fever seemed to have struck a fresh gait, and the figures went galloping upward. There were 72 cases reported on July 14, and by the next week they had jumped to 98. By the following week, however, the total had reached 138 cases, and on August 4 229. The fever receded somewhat then, and kept decreasing, fluctuating in numbers until the first week in December, when it reached a normal basis of 45 cases.

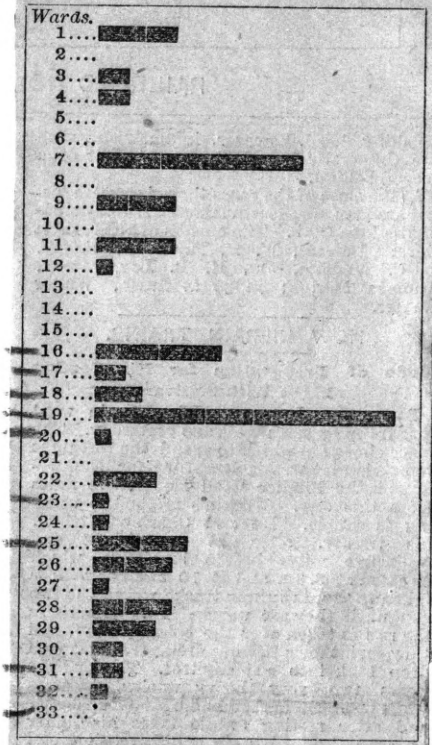
#### THE WEATHER CAUSES FEVERS.

The first of the year, with its stupidly mild weather, marked another rise of the dread disease, the returns for January 26 showing a jump to 192 cases for the preceding week. Then the figures took another downward slope until March, when for the week previous to the 23d only 60 cases were reported. By April 28, however, the disease had jumped again to 116 cases for the week, when it again declined until the week ended June 23, when only 44 cases were returned.

Through all the year Kensington had a supply of the fever entirely disproportionate to its share of the city's population, the Nineteenth ward keeping up its huge, gloomy share without an apparent effort.

#### WHAT LAST WEEK'S RETURNS SHOW.

Returns for the week ended yesterday show a total of sixty-two cases of typhoid in the city, which is an average of a fraction less than two cases per ward. Yet the Nineteenth has fourteen cases, the Eighteenth four and the Twenty-fifth five.




The above comparative table shows the relative proportion of cases of typhoid fever in the various wards, based upon the last report of the Health Officer.

#### STARTLING FIGURES IN PAST YEARS.

Statistics of the Health Office show that the six wards comprising Kensington and Port Richmond have been for over a quarter of a century subject to a greater death-rate than any other section of the city. As far back as 1862 the Nineteenth ward had 51 deaths from typhoid fever when the average was 26.16. The next highest was the Twentieth ward with 41 deaths. In 1875 the Nineteenth ward had a total of 74 deaths from typhoid, while the average for each ward was but 16.76. In 1885 the figures were still more startling. Of the 322 deaths in the whole city during that year the Eighteenth ward had 73; the Nineteenth, 43; the Sixteenth, 22, and the Seventeenth, 27, when the average per ward was only 10.36. In the ten years from 1876 to 1885 inclusive there were 5407 deaths from typhoid fever in the city. Of these the Nineteenth ward had 536; the Seventeenth, 331; the Eighteenth, 317; the Thirty-first, 273, and the Sixteenth, 151, when the average was but 176.34 deaths per ward.

#### A QUEER FACT ABOUT EPIDEMICS.

There is a little consolation, however, in the queer fact that great epidemics do not increase the annual death rate of the city. Although there were upward of 700 deaths from the cholera scourge in this city some years ago the total number of deaths during that year were nearly 300 below the previous year. The same strange fact is noticeable during the last epidemic of small-pox.

#### A TOWN MEETING TO BE CALLED.

A movement is on foot in the Nineteenth, Twenty-fifth, Thirty-first and Thirty-third wards for a public meeting for the purpose of bringing to the attention of the authorities the actual sanitary condition of these wards, and if possible to suggest some remedy to abate the prevalence of typhoid fever and kindred diseases in this district. The citizens of the Nineteenth and Thirty-first wards are the most interested in the subject, and will demand first that the pumping of water from the Delaware Water Works to the Lehigh avenue basin be discontinued, and that immediate steps be taken to improve the condition of Gunner's Run. To these two causes are attributed the great amount of disease now prevailing in the northeastern section of the city.

This is not a spasmodic effort, but has been growing among the people. It has the support of the physicians of the district, and one or more of the leading practitioners are expected to be present at the meeting and present their views from a scientific standpoint.

#### GERMANS MUST BECOME ACCLIMATED.

That typhoid fever has prevailed in the northeastern section of the city for a long time is proved by the large number of newly arrived servant girls, Germans especially, who are attacked with the disease. The Episcopal Hospital, the Jewish Hospital and St. Mary's Hospital have cases of this kind for treatment almost constantly, and it appears these servant girls must pass through the disease in order to become acclimated to the district.

LEDGER AND TRANSCRIPT.

Philadelphia, Saturday, July 20, 1889

# CORRESPONDENCE.

## OPEN LETTERS ON A VARIETY OF SUBJECTS.

**Typhoid Fever in Philadelphia—A Noble Life—How English Streets Are Paved—Notes and Comments.**

### Typhoid Fever in Philadelphia.

[FOR THE PUBLIC LEDGER.]

MR. EDITOR:—I was surprised to read in a prominent New York paper recently that typhoid fever was terribly on the increase in Philadelphia, and that this increase was due to the increasing numbers of population settling along the Schuylkill, with the usual explanation that the increase in typhoid came from the bacillus, that had been discovered by some famous pathologists in the old world to be the cause of typhoid fever, and which are supposed to be cultivated by the fæcal matter getting into the Schuylkill from typhoid fever patients.

Supposing that typhoid fever is really spread in that way through our city, we ought to have an unusually favorable season against typhoid instead of one so bad, for the immense and unusual volume of water that has been pouring down the river this season, and the comparatively small quantity used, through the cool weather being unfavorable to thirst, should have decreased enormously the risk of infection. No better argument against the cry about the typhoidal character of the Schuylkill water could be adduced than the experience of the present season.

Aside from pleasant badinage in the short and spicy paragraphs, where no one expects subjects to be treated seriously, I have usually found New York papers discuss Philadelphia affairs fairly, and I thought it might be of interest to them, and possibly to others, to show, from undoubted health records, that typhoid fever is on the decrease in our city. If I were disposed to believe that there was the remotest connection between the disease and the Schuylkill water, and that the water was really badly polluted, I could readily argue from the figures that the greater the pollution the greater the public health.

I have before me the Health Officer's annual report for 1885, pages 196, 197, 198, 199. All the statistics relating to typhoid fever in Philadelphia from 1861 to 1885 are given there. Before examining the figures critically we must remember that the population of Philadelphia in 1860 is given as 565,529; in 1870, as 674,622; in 1880, 847,170; in 1885, 855,000.

The last figures are based on four and a half times the Assessors' voting lists. The first surprise is to note that the deaths at the top of the column, 1862, are 629—greater, for all the increase in population, than the bottom figure in the column 1885, which is but 610. Not so many people died from typhoid fever when we had 855,000 people as a quarter of a century before, when there were but 565,000. But this would not be a fair test. There have been especially light and heavy visitations all through the record. In 1866 there were but 381 deaths, and in 1879 there were but 344. In 1865, 773 deaths, while in 1876 there were 761. The only fair way is to take averages, and whether we take these averages in blocks of five, or in any other set of numbers, they show that typhoid fever is rapidly on the decrease in our city as the years roll on. We find, taking the five years at the top of the quarter century, deaths:

2916 against a population of 565,529;
3146 against a population of 855,000,

only 230 more. In other words, while population was increasing at the rate of .51, typhoid fever could only advance at the rate of .8. These calculations are based on a schedule of 24 years. In one of 25 full years the figures still favor the decrease. We have 842 for the first 5 from 1861. 2858 for the last. Typhoid fever has practically stood still while population has been advancing. Let us try another set of averages, the 10 years previous to 1880 and 10 previous to 1870, so as to compare them with the official figures of population. In 1870, population, 674,622; deaths previous 10 years, 4767. In 1880, population, 847,170; deaths previous 10 years, 4505. In spite of the enormous growth of population in the last decade the deaths were actually 262 less than in the decade previous.

But how about the enormous increase in deaths the last two or three weeks, on which I note, one of the New York paragraphs also comments?

The figures in the table before us show that there is always a greater fatality in July than June, and the present year is no exception. Taking all the 24 June months between 1862 and 1885, the total deaths in that period were 769, but in the Julys of the same period there were 1043.

Just how our New York friends have got misled as to the actual facts it is fruitless to inquire. It may, however, be worth remembering that we have among us a very powerful company, that has long been endeavoring to get the water for the city from the upper Delaware, and companies that are continually pressing on the city schemes for aerating, filtering and doctoring the Schuylkill water—companies that could have no hope for success if the Schuylkill water were absolutely faultless. Without the slightest idea that any poison is lurking in the Schuylkill water, it is well recognized by the city authorities that we may as well have the best in the world as that which is only tolerable, and that City Councils, the Mayor and the Department of Public Works are in perfect harmony in their endeavor to obtain it. Without borrowing a dollar, $600,000 were appropriated last December for extensions this year, which, in great part, means larger subsiding basins, where the mud may have time to settle, when we have the best water of any city in the world.

THOMAS MEEHAN,
Common Council, Twenty-second Ward.

THE EVENING TELEGRAPH

TUESDAY, JULY 23, 1889.

# TYPHOID'S ORIGIN.

## PORT PHYSICIAN RANDLE ON THE DELAWARE SUPPLY.

### CAUSES OF THE EPIDEMIC IN THE 19TH AND NEIGHBORING WARDS—KENSINGTON SEWERAGE DENOUNCED—ALL SEWERS SHOULD BE FLOODED AND WASHED OUT TWICE A WEEK—THE WATER SUPPLY SHOULD BE BROUGHT FROM ABOVE TIDE WATER.

Port Physician William H. Randle presented to the Board of Health to-day a comprehensive report upon the prevalence of typhoid fever in the 19th and neighboring wards. About three weeks ago the Board of Health, prompted by the alarming increase of fatal typhoid cases in that district, delegated to Dr. Randle an investigation of the facts and the causes for the epidemic; and the report, which is given below in full, is the result of a searching inquiry to which the Port Physician has given all his time since then.

THE REPORT IN FULL.

To the President and Members of the Board of Health.—Gentlemen: In compliance with the resolution passed by the Board of Health requesting me to investigate the cause of the excess of typhoid fever in the 19th and neighboring wards, I beg to submit the following report:—

INCORRECT HOSPITAL REPORTS.

Commencing with the apparently alarming number of cases in the 19th ward, I find by the reports made to the Board of Health for the last six months, beginning January 1 and ending July 1, one hundred and thirty-nine cases; but an investigation proves this report incorrect, as it is in a majority of the reports of the diffent wards made to the Board of Health. Situated in the 19th ward are the Episcopal and St. Mary's Hospitals. All cases taken to these Hospitals, irrespective of their former address or where they come from, are accredited to the 19th ward. To illustrate: any person coming to this city from any other locality who should be stricken down with typhoid fever, and taken to one of our hospitals, though the prodromic symptoms were developed before his departure from his home, the case would be credited to the ward in which the hospital is located. The Board of Health should compel those in charge of hospitals to report all cases of sickness such as they are required to report, correctly, viz.: by giving their full name, former address, etc. From the manner in which the reports are received at the present time, the Board of Health can form but an imperfect idea of the true condition of things.

The 19th ward, instead of having one hundred and thirty-nine cases of typhoid fever, as heretofore reported, in the last six months, has had, in reality, only fifty cases, a difference of eighty-nine. These erroneous reports cannot be too quickly revised and put upon the records of the Health Office properly.

SANITATION WANTED IN KENSINGTON.

The sewerage of the Kensington district is, to draw it mildly, in a bad condition. There are a very large number of cesspools situated, of necessity, in close proximity to the dwellings and wells, the germ of disease percolating the earth and reaching the water. Many of these cesspools have not been cleansed within the memory of the oldest inhabitants. At best they are an abomination, and detrimental to health. These cesspools should be filled up and underground drainage substituted. And I urgently recommend that necessary steps be taken so that all sewers may be flooded and washed out thoroughly at least twice a week.

The number of privy wells located in this section, many of them used as receptacles for garbage and other foreign substances, contribute largely to the pollution of the atmosphere. As the Board of Health act only upon such as are complained of, a more thorough sanitary inspection should be had; but with the small force of inspectors it is, of course, not practical to accomplish more than is being done at this time in the regular way.

HOW THE RUN IS POLLUTED.

The drainage of the Kensington district is accomplished in part by large sewers: these sewers are the depository of filth, human excreta, offal of every description, contaminated rags saturated with pus from hospitals, etc. This decomposed and noxious material is carried through the sewers into the Delaware River at the water's edge, facing the city, there to remain in the eddy of docks, exposed to the rays of the sun, and its foul odors carried in all directions, until the flowing to and fro of the tide washes it up to the water-works. This condition of affairs may be partially corrected, but not entirely remedied, by extending the sewers out to the main channel of the river, and there deposit this reeking mass of poisonous matter, so prejudicial to health.

LEFFMANN'S ANALYSIS.

As preposterous and unpardonable as it may seem, yet it is nevertheless true, that within two hundred yards of the terminus of one of the most foul of all these sewers, is situated the Kensington water-works, with a pumping capacity of about ten million gallons in twenty-four hours—in part to supply the inhabitants of this portion of the city. This water, analyzed by one of the most competent and best-known analytic chemists in Philadelphia, gives the following result:—

"Dr. W. H. Randle, Port Physician.—Dear Sir: I have made at your request tests of three samples of water, marked as follows:—

No. 1—From main at Kensington Works, Otis street wharf.

"No. 2—From reservoir at Lehigh avenue.

"No. 3—From hydrant at Neafie & Levy's Works.

"Samples Nos. 1 and 2 exhibit marked impurity. They possess the odor of decomposing organic matter, and the residue left on evaporation also exhibits this character. The quantity of nitrates present is low—mere traces in No. 1, and 0.4 parts per million in No. 2. This fact, taken with the evidence of the excess of organic matter, seems to indicate recent sewage contamination not yet fully oxidized. The amount of the sample in each of these cases—about eight ounces—did not permit of the usual tests for organic nitrogen; but there can be little doubt, from the other characters of the water, that such results would have been unfavorable.

"The third sample gave—

Nitrogen as ammonium compounds .032 per 1,000,000
Nitrogen by permanganate.....140 per 1,000,000

"The amount of nitrate is also low in this case, and we have therefore evidence in this sample of unoxidized organic matter in considerable amount. The odor of the solid residue was not, however, in this sample so distinctly marked as in the samples Nos. 1 and 2.

"It was not considered necessary to determine the chlorine or other mineral ingredients, as these do not vary sufficiently to serve as an index of impurity.

"The results lead to the conclusion that all these samples show decided organic pollution of recent origin, the organic matter being in a decomposing condition. This result merely bears out what has for a number of years been noted with regard to the supply from the Otis street works. Yours truly,

"HENRY LEFFMANN."

DISEASE FROM FOUL WATER.

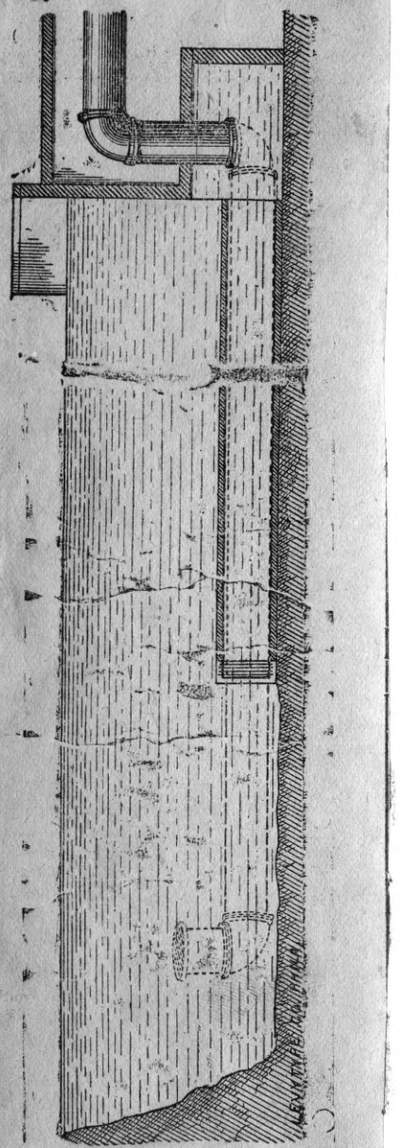
This result has practically been obtained with every test that has been furnished. But why trouble an analytic chemist? You have only to see the location of the water works and sewers to understand how impossible it is to secure pure water at this point. Sceptics might visit Hughes & Patterson's, Neafie & Levy's, and other large establishments along the river front, and they would find that about 20 per cent. of their employes constantly suffer with typhoid fever, diarrhœa, and dysentery, caused by foul drinking water. They freely admit that so long as they abstain from drinking the water they have no such troubles.

LESS TALK AND BETTER WATER.

The subject of pure water for Philadelphia is so old that indeed it is no wonder the public are weary of hearing it discussed; but the time has come when we should have less talk and more pure water. No city can possibly secure good water by getting its supply from rivers directly opposite the city. The supply should be brought from above tide water. As the Kensington and Lardner's Point Water Works cannot be dispensed with at the present time, or until our city authorities shall change our entire system of water supply, it would be well to investigate the means of the present supply, and see if we cannot for the time being make some improvement as here recommended.

DR. RANDLE'S REMEDY.

This cut illustrates the conduit in use at the present time, which extends out from the pier only 150 feet.



The conduit terminates abruptly, with iron bars as a kind of screen. I would suggest that a flange pipe be used instead, and made to extend out and beyond, and eastward of, the main channel, with a "goose-neck" and screen, as shown in the accompanying cut.

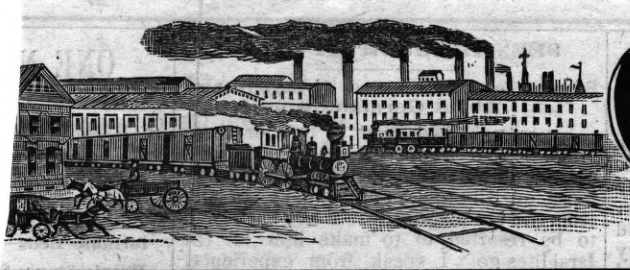
This improvement could be made at a comparatively small cost, and the improvement in the water supply would more than justify the expenditure. The fact is, this change would furnish the best water obtainable from the Delaware River.

I believe it is of the utmost importance to the sanitary improvement of the city that a larger force of inspectors should be employed permanently, to search out and have removed the many nuisances created from time to time. That fevers of different types arise from the numerous filth-spots in the city I have no doubt. The people themselves should be instructed, through the public press, of the importance of cleanliness, for their own preservation. Respectfully yours,

W. H. RANDLE, Port Physician.

Philadelphia, July 18, 1889.

The report was referred to the Sanitary Committee.



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MARCH 1, 1889.

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# TYPHOID---MUSHROOMS.

## THE MUCH ABUSED SCHUYLKILL WATER FINDS A DEFENDER.

## NOT SO YELLOW AS PAINTED.

**Prof. Meehan Talks before the Germantown Horticultural Society on Fungoids and their Connection with Disease.**

The regular monthly meeting of the Germantown Horticultural Society was held in Association Hall, last evening. The exhibits of plants was small, but the plants were fairly well grown and in good bloom. The following premiums were awarded: For the three best Azaleas, three varieties, first to John Warr; For the six best Geraniums, six varieties, in four inch pots, first to John Warr, second to Martin Constable; For the three best Cinerarias, three varieties, in six inch pots, first to John Kirby, second to Henry Nelson. The following special premiums were awarded: For a Hydrangea, to Michael Sammon, gardener to Joseph Shoemaker; for a collection of plants, to Robert Morrison; for a collection of Geraniums in bloom, to James Barrows; for the same to Thomas Meehan & Son; a special mention was given to Charles J. Wister, for a specimen of Erianthus hyemalis.

Professor Thomas Meehan in referring to a mushroom on exhibition said it was not a plant, but rather the flower of a plant that had its existence under ground. It was thread-like and technically known as the mushroom spawn.

This spawn, the real plant,, fragile and almost invisible, had wonderful powers of existence. Kept dry, it had been known to preserve its vital power for fifty years, pushing into renewed growth, and producing its flowers in the form of mushrooms at once on the occurrence of the requisite conditions of heat and temperature, as well as if it had not slept in its earthly tomb for half a century.

These conditions have to be very exact before any of the mushroom tribe will develop into growth. The earth has to be warmed to 60 degrees, and moisture has to fall just when the temperature of the earth is at that point; much above or below this temperature, and without the moisture, no mushroom will grow. Plants of this family, or its allies, constitute the microscopic plants whech we have come to dread so much in connection with diseases.

These species of plants that one can, in comparatively few cases only, see with the naked eye, are probably as numerous as the larger and more beautiful flowers which so charm the world. Powerful as our microscopes are, it is more than probable that there are myriads of plants as yet unknown. They are very destructive, not waiting for diseased organizations, as was formerly believed, but attacking and destroying the healthiest. They only wait, as the larger mushrooms do, the nice combination of conditions necessary to start them into growth. As among flowering plants, some like a high temperature and some a low one, and hence different diseases resulting from the attacks of those microscopic plants, prevail at different seasons.

"No microscope has yet been made powerful enough to enable us to perceive the little plant that produces yellow fever, yet analogy has taught the intelligent student of plant life in relation to disease, that a plant it must be, and one, too, which like the geranium or heliotrope, will not endure the slightest frost.

"Again some plants will not grow at high elevations, and succeed only on the sea level. The yellow fever plant is of a similar lowly disposition, and, it is said, rarely germinated in an elevation more than a few hundred feet above the level of the sea. In their travels these plants also follow the laws regulating larger plants, some going in one direction of the compass, some in others. The once mysterious potato disease was caused by one of these microscopic plants, now known as *Perenospora infestans*. Its course was usually northwardly, and in its germinating stages traveled about fifty miles a day. The famous horse disease of about a decade since journeyed from north to south, and at the rate of about seventy miles a day. This disease was carried by a species of *Aspergillus*. It did not mean that the spores traveled. They were probably omnipresent. Even the spores of yellow fever might be in the atmosphere, all about us now, but nice conditions prevail in certain lines, and then the omnipresent spores germinate and our struggle with them begins. Another spore, a species of micrococcus, produces diphtheria; others, undoubtedly causing special disorders, have not been definitely ascertained, as in the case of the yellow fever. Malarial troubles are of this character. Decaying vegetable matter—the former supposed cause—has nothing to do with it, nor have marshes of themselves anything to do with it; but, when the mud cracks under a warm sun, the peculiar mushroom plant that loves the dark crevices grows and poisons the atmosphere."

Continuing his remarks, Professor Meehan said: "Few people have any idea of the great progress which science has made in these directions. There is no necessity for jumping at conclusions in relations to the causes of disease as so many intelligent people do.

"When I first went into City Councils, Colonel Ludlow was sure the Schuylkill water was poisonous, because there was a small portion more of albuminous matter in it than some good chemists thought there ought to be. This, it was urged, caused typhoid fever. Some Parisian thought that he had found a little microbe called a 'Bacillus' in the excreta of typhoid fever sufferers, and, because it was only present in these cases, it was assumed that this was the cause of the fever. The whole world follows, and now it is bacteria in the Schuylkill water, and no one thinks of talking about an overplus of the albuminoids.

"At Chestnut Hill, where the people are supplied from a living spring gushing out from the top of the eminence, and which can possibly have no drainage through the rocky covering that envelopes the channel of the spring, typhoid fever has been as bad as anywhere.

"Typhoid fever has spread gradually over the whole eastern slope of the United States, and is progressing daily, as the horse disease and potato rot did, perfectly indifferent whether the people of Canada or Georgia drink Schuylkill water or not.

"February and March in every year are the seasons the disease prevails generally in Philadelphia. The nice atmospheric conditions it desires seem to prevail then to a more perfect degree.

"We have the most typhoid fever when there is the least Schuylkill water drank. In the hot and dry months, when Schuylkill water is in everyones mouth, our city is nearly free from typhoid fever."

"It is scarcely creditable," said Mr. Meehan, "to the general intelligence of professional men that so much that has been positively known as to the behavior of the minute members of the mushroom family should remain stored in the archives of scientific institutions, and be made of so little general use in the welfare of the human race."

Referring to the method of gathering the specimens and thus tracing the travelling ratio of plants causing the disease, the Professor said: "Moorhouse, who discovered the one causing the horse disease, used wet glass. The plants were caught as they floated through the atmosphere. The Aspergillas was a comparatively large one, and readily examined by a microscope of average power. Days in succession no plants would be found on the glass; but a few days after their presence they could be detected there. The 'epizooty' was apparent in the horses, and the air passages of the poor brutes found gorged with them.

"The progress of these and other diseases was readily tracked in this way." Professor Meehan concluded this portion of his address by suggesting to the audience that there were "a good many methods of treating mushroomy subjects besides frying or broiling them."

**DOWN BELOW THE P**

In a debate on Col. Ludlow's behavior General Owen said

[Reprinted from the "PRESS" March 19th, 1889.]

*413 Locust Street.*
*Philadelphia, March 15th, 1889.*

In the published report of the proceeedings of the Germantown Horticultural Society, I find statements by Prof. Thos. Meehan in reference to the quality of the water of the Schuylkill River, and as to the bearing of its quality upon disease. These statements are seemingly based upon several conditions set out by Mr. Meehan.

He says: "*Now it is bacteria in Schuylkill water, and no one thinks of talking about an overplus of the albumenoids.*"

The fact is that the amount of albumenoids carried by the Schuylkill water has been steadily on the increase so that during the last year Schuylkill water rivals in impurity the water of the Delaware in front of the city, and is sometimes excelled in quality by the water of the Delaware River at Lardner's Point.

The "*albumenoids*", to which Mr. Meehan refers, during the month of January amounted to as much as 0.575 parts in 1,000,000 in water delivered from the street mains and filtered, an amount of albumenoid ammonia which would absolutely condemn any water, as being unfit for use, even when it is measured by the most liberal standard for allowable impurity.

Several examinations of the water supplied from Chestnut Hill Spring showed the presence of household

drainage in considerable amount, and it was found that drainage of that description was flowing into the source from whence the water was pumped.

Investigation also disclosed the fact that the use of an underground system of drainage for waste and water-closet wash, had introduced pollution into the underground sources from which the wells in the neighborhood obtained their supply of water.

In another instance, in the Germantown District, a pump-well was converted into a cess-pool, and in consequence the wells in the neighborhood which drew their supplies of water from the same source were polluted.

The following table from the official records of the Board of Health shows at what seasons of the year Typhoid Fever is most prevalent in Philadelphia:

1888 CASES OF TYPHOID FEVER REPORTED TO BOARD OF HEALTH.

| | | | |
|---|---|---|---|
| January | 185 | July | ***447*** |
| February | 192 | August | 290 |
| March | 200 | September | ***628*** |
| April | 290 | October | 378 |
| May | 306 | November | 190 |
| June | 244 | December | 232 |

A glance at this table will show the incorrectness of Mr. Meehan's statements—"*February and March in every year are the seasons the disease prevails generally in Philadelphia.*"

"*We have the most Typhoid Fever when there is the least Schuylkill water drank. In the hot and dry months when the Schuylkill water is in everybody's mouth, our city is nearly free from Typhoid Fever.*"

Mr. Meehan's statements seem to me to be in direct opposition to the facts.

In pursuance of an investigation of the subject of Typhoid Fever and other diseases in this city, I have obtained information from other sources, and among them from the Health Departments of several cities the ratio of deaths from Typhoid Fever to population during the past four years, selected from which are the following:—

| | Deaths—one in each. | | | | Deaths in each 100,000 of the population in 1888. |
|---|---|---|---|---|---|
| | 1885 | 1886 | 1887 | 1888 | |
| New York | 4752 | 4491 | 4656 | 4243 | 23.5 |
| Baltimore | 2691 | 2871 | 2802 | 3107 | 32.2 |
| Boston | 2612 | 2693 | 2186 | 2441 | 40.9 |
| Chicago | 1270 | 1458 | 1989 | 2213 | 45.1 |
| PHILADELPHIA | 1563 | 1580 | 1610 | 1307 | 76.5 |

The death rate from Typhoid Fever in Philadelphia in 1888 is the highest of any of these cities. It is 70 per cent. worse than the worst in the table, and 225 per cent. worse than the best. The number of deaths in Philadelphia from Typhoid Fever in 1888 was 783.

Careful observation and comparison have shown a positive connection between the cases and deaths from this disease with the condition of the water supply.

Whatever may be the exact cause of the disease (whether bacteria or not), its mildness or severity is evidently connected with the rise and fall of, and carriage of material by, our water supply.

If the death rate from Typhoid Fever in Philadelphia could have been reduced to that of the city of New York, there would have been a diminution of over 2000 cases of sickness, and over 500 in the annual summary of deaths, from that disease.

CHAS. M. CRESSON, M. D.

THOMAS MEEHAN. ESTABLISHED 1852. THOMAS B. MEEHAN.

# Meehans' Nurseries,

OFFICE:
UPPER CHURCH AND CHEW ST.

DEPT. OF PUBLIC WORKS RECEIVED JUN 20 1889 PHILADELPHIA

Germantown, Phila. June 19 1889

Dear General,

I find I have, by chance, preserved the Envelope and Water article of Cresson's, and send it to you. Also I find I have saved the Ledger report of my Remarks which drew Cresson on me. Though quotation marks are given, I did not read any address. As you know, ~~I~~ My horticultural cattle are wholly "off hand", and though I am quite willing to stand by this very good report, the pencil addition at the bottom of the column, ~~was~~ omitted in the report, was what I did say.

In reply to this letter of Cressons, I send a brief

note to the Press, calling
attention to the table in
Mayor Kiely's ~~2nd (or 1st)~~
annual report (not having
it now before me I am
not sure which one)
showing that there was
a continual decrease
in the deaths from typhoid
fever in our city during
the past quarter of a
Century. The Press ~~de~~
did not publish it,
but it afterwards appeared
in the Ledger. I do
not appear to have
saved a copy of the
Ledger article.

Very truly Yours

Thomas Sullivan

JUL 28 1916

SUMMER RESORTS

PUBLIC LEDGER

POULTRY : THEATRES
REAL ESTATE

Philadelphia, Sunday Morning, July 23, 1916—Second Section

# CHANGES PLANNED IN FEDERAL BUILDING

## Entire Appropriation of $80,000 to Be Expended in Improving Postoffice

## NEED ADDITIONAL ROOM

### Conveyor System and Mezzanine Floor Expected to Relieve Congestion

The $80,000 appropriated for the local Postoffice in the sundry civil bill which has just been enacted into law will be devoted entirely to improving the facilities for handling mail in the room on the first floor of the Federal Building, according to Thomas M. Johnson, superintendent in charge of the mails.

So imperative has the need for more room in the mailing department become that this appropriation, through the demands of the Treasury Department, was included in the sundry civil bill which takes care of minor improvements. The changes proposed will enable clerks to handle the mail with greater speed and one-third more floor space will be added to the mail rooms. This, according to the postal officials, offers only temporary relief from the present congested conditions and in no manner detracts from the absolute need for a new building.

The entire appropriation will be expended upon the installation of two new divisions, a mezzanine floor in the mailing room and a conveyor system for handling mail in that room and connecting it with the entrances and exits. The mezzanine floor will run around the room on three sides, and the additional space will be utilized by the devices and the men employed in sorting mail for its various destinations. Conveyors will carry it down to the main floor and to various parts of the building, so that there will be an intimate connection between the two floors. This will permit the additional space on the first floor to be used in handling mail passing in and out of the building and provide additional room for the large clerical force.

The postal officials expect the conveyor system greatly to facilitate the movement of the mail within the building. It consists of a series of belts carrying baskets at regular intervals. It will be possible to transport mail from one place to the other by merely throwing it in these baskets, from which it is extracted at the end of the route.

As fast as the letters mailed at the front windows accumulate they will be dumped into one of these baskets and carried to the mezzanine floor, where they will be sorted according to their destination. Each pile then will be dropped into one of the baskets and carried to the exit, there to be placed in bags and piled on the wagons for the mail trains. Other bundles will be conveyed to the exit devoted to city deliveries and still other mail will be dropped into the basement and placed in the pneumatic tubes. As 3,000,000 pounds of mail are handled in this room every month the necessity for such a system becomes obvious.

Other improvements are being made in various parts of the Federal Building. The dark room, where Captain Matthew Griffin, of the Secret Service Department, makes [illegible] headquarters is being divided into three [illegible] T-shaped wall. An entire new set of steel filing cases is being installed in the office of the postal inspectors, in order to relieve the pressure on the record room on the fourth floor. Immense vaults are being placed in the rooms of the bank examiners, and the entire fourth floor of the building is being repainted and redecorated.

## FOR CUBAN NAVAL SCHOOL

### United States to Be Asked for Artillery and Submarine Experts

HAVANA, July 17.—The Cuban Government has determined to ask the United States Government for several officers who are experts in artillery, torpedoes and submarines for Cuba's new naval school.

# DU PONTS PROTEST AGAINST TAXATION ON GUNPOWDER

## President of Company Writes Majority Leader Kitchin That Firm Is Benefactor to Cotton and Other Industries

WILMINGTON, July 22.

A LETTER written by Pierre S. du Pont, president of the E. I. du Pont de Nemours Company, to Representative Claude Kitchin, chairman of the House Ways and Means Committee, was made public today. The letter, protesting against additional taxation on the manufacturer of "gunpowder and other explosives," has not been given out by the majority leader although written July 8. The bill is still pending in the Senate.

The letter follows:

Dear sir—The du Pont Company desires to submit to the Ways and Means Committee, House of Representatives, and to other members of Congress, certain facts bearing on the manufacture of "gunpowder and other explosives," taxation on which is provided in H. R. 16763.

We regret that we did not have an opportunity to be heard before this bill was framed and refrained from requesting a hearing because we felt that any suggestion volunteered might be misconstrued. However, the proposed tax is of so vital interest to this company and the 60,000 men now in our employ that we feel justified in sending you this communication.

First—This bill makes the du Pont Company and other manufacturers of explosives the subjects of double taxation, i. e., it places a tax on net income and on gross receipts.

Second—The bill discriminates against the manufacturers of explosives, singling out their industry for drastic treatment amounting to penalization, while others engaged in the manufacture of munitions of war and making equal or greater profits are permitted to go free. For example:

From the beginning of the war to and including April last there were exported from the United States for military purposes:

Autotrucks and passenger automobiles, to the value of $142,000,000.

Aeroplanes and parts, $7,800,000.

Motorcycles, $4,162,000.

Rubber, including automobile tires, $41,800,000.

Woolen goods, $70,000,000.

Imposing as these figures are, they involve no great part of the nation's exports and a trifling part of its total profits attributable to the war. There could be added to the list such articles as canned meats, army rations of various kinds, shoes, harness, saddles, blankets, kerosene, gasoline, acids, alcohol, locomotives, parts of submarines, range-finders, stamped metal military equipment, swords, bayonets, bromine and other military gases, barbed wire and other products of iron and steel. Indeed, the list would include the products of almost every line of effort and industry. While we would not advocate a tax thereon, your attention is called to the fact that horses, to the value of $128,872,000, and mules, to the value of $31,186,000, have been exported for military purposes.

Third. The bill requires the payment of 8 per cent. tax on large sales; this leaves a profit too small for the risks of explosive manufacturers. If 10 per cent. is the maximum, no one can afford to take the risk of the minimum. This 10 per cent. must be a maximum in many cases if not [illegible] all the profits above the amount [illegible] retained by the Government until a certain percentage of profits is reached, depending on the relation of sales to investment.

Thus if the sales of a corporation are double in value the manufacturing investment, 26 per cent. must be earned before the company is allowed to retain more than 10 per cent. If the gross sales equal three times the value of the manufacturing plant, 34 per cent. must be earned on capital invested order to produce returns beyond the 10 per cent. allowance of the bill.

In other words, if the sales are double the plant value, the Government will receive 60 per cent. of the total profits when the earnings are 26 per cent. on the investment; and if the sales are three times the value of the investment, the Government will receive 70 per cent. of the profits if the investment yields 34 per cent., and in no case will the manufacturer receive more than 10 per cent. on his investment.

Fourth. Why should "gunpowder and other explosives" be singled out for discriminating, burdensome taxation even as compared with other materials classed as "war munitions" on which the bill provides taxation? This is to say, why should a dollar received from gunpowder, or some other explosive, bear a tax of 8 per cent, while a dollar received from the gun that burns this gunpowder bears a tax of only 5 per cent, and the copper for shell cases but 3 per cent? The value of the last-named commodity (copper) has more than doubled since the outbreak of the war, with no material increase in the cost of production; whereas the raw materials entering into "gunpowder and other explosives" have advanced in some instances as much as 2000 per cent. For example, short-fiber cotton has advanced from two cents to eight cents per pound, toluol from 20 cents to $4 per gallon, benzol from 20 cents to 80 cents per gallon, fuming sulphuric acid from $15 to $150 per ton. Meanwhile there has been a constant reduction in the price of smokeless powder, due to competition and market conditions, present prices having fallen below the level that obtained before the war. The maximum price reached at no time a 20 per cent advance over previous prices for foreign business.

Fifth. To make possible the production of explosives to meet the unusual demands, large sums have been invested in construction and equipment, the intrinsic value of which is maintained only in proportion to the use thereof. This represents capital invested largely from proceeds of munition sales and cannot be construed as legitimate taxable profits for reasons of depreciation of value as above noted. To the extent that future markets do not permit of the operation of these extensive plants, their intrinsic value is that of scrap only.

Sixth. The retroactive feature of this bill would ordinarily mean absolute disaster to the manufacturer of "gunpowder and other explosives." The foreign business that came to us was embraced in many orders representing 180 separate and distinct contracts. Most of these contracts have been completed, the money paid and distributed; some of it to stockholders, much of it being invested in other industries. Many of the stockholders who were beneficiaries of this advance have disposed of their holdings. When these contracts were made no such expense item as this was considered in fixing the price of our product. It is impossible now to distribute in any manner this additional burden, compelling the customer to bear his share, or forcing the original stockholder to assume his part. To force the stockholders of today to bear a tax amounting to possibly $20 or more per share of $100, which should have been visited on the stockholders of months ago, must impress any one as inequitable and indefensible. Moreover, we have no means of protection against this added burden in contracts which are now in force and which we are bound to carry out in the future.

Seventh. This tax, if imposed upon us, may prevent our taking further business of this character. This will mean the inevitable discharge of many employes from the service of the company. The total roll now aggregating approximately 60,000, must then be reduced to the five or six thousand necessary to operate the commercial business of the United States. We had expected to continue our maximum industrial activity as long as this war lasted, but the provisions of the pending bill makes this an undesirable business risk.

Eighth. Guncotton, which is the chief ingredient entering into the manufacture of smokeless powder, and a material exceedingly sensitive as an explosive, will come within the classification of "other explosives." This tax on guncotton will prove burdensome to a number of important domestic industries to which it is essential in the products they manufacture.

We admit that the manufacturers of "gunpowder and other explosives" have enjoyed a period of exceptional prosperity during the last 18 months, but that the net results accruing have justified Congress in placing upon them no such burden of taxation as is contemplated by this bill.

While we have received what might appear as high prices for our products, we have been forced to meet unusual expenses. When this foreign crisis came it found us with a military explosive capacity of approximately 10,000,000 pounds per annum. To meet the demands made upon us necessitated our multiplying this capacity many times, all preparation being made under pressure and regardless of cost. At the threshold of this undertaking, to insure harmony of action and attract labor, we advanced the wage scale to a standard never before known in the explosives industry. At the same time, we gave notice of a 20 per cent bonus to all employes, and, in addition, placed every plant under our jurisdiction on the eight-hour basis. The unusual conditions compelled us to go to great expense, inclosing our plants in such a way as to protect them from destruction, illuminating adjoining territory and maintaining a guard system comparable only to a standing army.

From the date of the first contract we were forced to face an ever-ascending scale of prices on raw materials. Nor were we ever permitted to forget the fact that when the war was over the buildings erected and the machinery placed, representing millions of dollars, would stand for little or nothing in the way of value.

We fear that many of the features noted above have not been taken into consideration before deciding to impose this tax. We have ever responded cheerfully to any taxation levied by our Government, but when such action is taken as threatens the destruction of our business, singling us out as specific objects of penalization, we feel that we are in duty bound to protest.

In conclusion, the manufacture of the particular military explosives which are likely to be taxed out of existence have contributed, probably more than any other industry, toward the revival of trade in this country. The du Pont Company alone has absorbed nearly 1,000,000 bales of short-fibre cotton formerly of little value and has paid handsome prices therefor, greatly to the advantage of the Southern States. It has paid directly in wages alone in the manufacture of military explosives in the last year and a half about $45,000,000, and has probably been indirectly responsible for the expenditure of a greater amount to the labor on raw materials and machinery which it has purchased. It has contributed amazingly to income and corporation taxes, and the enormous expansion that has been made assures our Government a supply of smokeless powder and high explosives in case of war which previously was never dreamed of. All this has been done without the Government contributing a dollar of expense!

There can be no "preparedness" without "gunpowder and other explosives." In a broad and liberal scheme of "preparedness" can Congress take chances on killing by taxation those industries without which there can be no "preparedness"?

Very respectfully,

E. I. DU PONT DE NEMOURS & CO.,

P. S. du Pont,

President.

# AMERICAN FORCED TO SERVE IN RANKS OF CARRANZA ARMY

## Seized by Bandits, Then Impressed as de Facto Soldier; Escapes and Reaches U. S. by Swimming Rio Grande

*Special Telegram to Public Ledger*

McALLEN, Tex., July 17.

AFTER three months involuntary service as a private in the Carranza army operating between Camargo and Reynosa, Thomas Clannan, an American from Detroit, Mich., last night escaped from military jail at Reynosa, swam the Rio Grande, and today is recovering from his experience in one of the 28th Infantry huts at Hidalgo. Clannan repeatedly faced death while with the Mexican army, and once a Mexican who tried to befriend him was summarily put to death as a traitor.

"One night, while swimming in the Rio Grande," said Clannan today, "I was seized with a cramp and lost consciousness. When I came to I was in the hands of Mexicans."

The Mexicans proved to be bandits. They forced Clannan to join them.

"One day the band entered the outskirts of Matamoros, directly across the river from Brownsville," continued Clannan, "and here a stronger force of Carranzisto soldiers met us. As I had been forced to join the raiding party, so my comrades, in their turn, were compelled to enter the ranks of the Carranza troops. Some of the men were sent southward, but I and most of my companions were kept on duty in Matamoros.

### Within Sight of U. S. Troops

"I remained in the town for two weeks, virtually a prisoner, within sight of the American soldiers on the Brownsville bank of the river. My pay as a private was $2 a day in Mexican money, which was barely sufficient to buy three tortillas and a cup of coffee daily. However, money was useless in Matamoros, as food could not be bought. The peons were living upon a handful of cracked corn each a day.

"My next station was at Monterey, and here I spent a month and a half in constant fear that I would be killed. Even if I was a regular enlisted man in the Carranza army, I was still a 'gringo' and consequently a person to be mistrusted. This suspicion grew and finally toward the end of my period of stay at Monterey my fellow soldiers made the hours I spent off duty miserable for me. When my scanty rations reached me I could seldom eat them, as some one always put great quantities of salt or pepper into them. The men became bitter toward me and in the end I was transferred to Reynosa, just across from the New York troops.

"After I arrived at Reynosa I was disarmed and put into the military jail. When I asked the reason for this, they said I was suspected of treachery. Brackish water and one tortilla a day was what they fed me. Among the men who guarded the jail was a young Mexican, almost a boy, whom I knew only by the name of Almeda.

"This lad and I because friends in a way and he used to smuggle food to me. Sometimes he would sit outside my cell at night and in the darkness whisper about his home life. He came from Herreras, in the State of Leon. When I felt that he could be depended upon I asked him to carry instructions to the United States soldiers at Hidalgo. He said he could not trust his memory and brought me a paper to write upon.

### His Messenger Killed

"Almeda, while on his mission, stopped at a 'cantina' and became drunk. He spoke of the paper he carried and was arrested. I was told he was shot the following morning. Personally, I know that he spent the night in the cell next to me and wept and raved all the time. The patio of the prison was below my cell and only in the morning I was awakened by the sound of a volley from the courtyard; the cell next door was empty.

"This happened a week ago and, while I felt that the Mexicans would hardly dare kill an American citizen, yet I saw plainly enough that if they chose to it would be easy for them to cover up the execution and I would be reported as 'missing.'

"Last night, thanks to a fire in the eastern section of Reynosa, I got away. When there is a fire in Reynosa the citizens summon help by beating a big gong swung from the two posts in the plaza.

"Everybody is supposed to run to the fire and help to put it out. At 11 o'clock last night the gong sounded, and in the general excitement my guard deserted his post and ran to the fire. I broke the door open and ran toward the river, a mile away.

"Fifty yards from the bank there is a shack, and as I neared it I heard shouts behind me. I knew my guard had returned, discovered my flight and probably with others was out after me. I hid behind the shack and waited. For two hours I lay there, and then, as everything seemed quiet, I rose and cautiously made my way to the river."

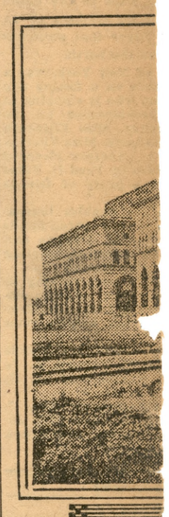
## RUSSIAN CAPTAIN A SUICIDE WHEN WARSHIP IS STRANDED

### Vessel Meets Mishap After Purchase From Japanese

VLADIVOSTOK, June ...—It is learned here on good authority that the captain of the Russian warship Peresviet, which was recently wrecked on a nearby island during a trial run, committed suicide shortly after the accident.

With two other warships, the Peresviet was recently purchased from Japan. The three ships in question were captured from the Russians by the Japanese during the Russo-Japanese war. After being refitted and manned with a Russian crew, the Peresviet was taken out for a trial run but ran ashore in a thick fog. In atonement the commander killed himself.

Japanese warships are aiding in attempts at salvage.



LARDNERS POINT, [illegible] THE LARGEST MU[illegible] STATION IN [illegible]

# IMPORTANT [illegible] INDIAN [illegible]

## Party Reache[illegible] After 12 Wee[illegible] quehan[illegible]

*Special Telegram*

HARRISBURG, Ju[illegible] headed by Dr. Willi[illegible] Andover, Mass., and [illegible] hoo, of Coudersport, [illegible] sylvania Historical C[illegible] been making a surve[illegible] River valley from it[illegible] last 12 weeks, has re[illegible] work is being done [illegible] Historical Commissio[illegible] the American Indian.

The party came do[illegible] of the Susquehanna in[illegible] being from Maine.

Fifty-seven graves [illegible] ancient burial ground[illegible] the first important fi[illegible] according to Doctor [illegible] femur bones were [illegible] size indicated that th[illegible] a half feet tall, he [illegible] signs found in the gr[illegible] or Susquehannock t[illegible] many of the graves [illegible] and tobacco pipes in[illegible] Indian age.

In one grave were [illegible] necklace. Many a[illegible] up, showing, he sa[illegible] buried with a[illegible]

[illegible] rounds.

From Athens the [illegible] N. Y., where Spanis[illegible] an ancient Andaste [illegible] was investigated, but [illegible] in [illegible] been occupied cou[illegible] Near Wilkes-Barre [illegible] throughout the who[illegible] many Indian town sit[illegible] Wilkes-Barre, along t[illegible] fireplaces laid out like[illegible] This showed, Doctor [illegible] wigwams occupied th[illegible] fireplaces were buil[illegible] wam. Bones of deer[illegible] would seem like buffa[illegible] here. The men dug [illegible] five feet before they [illegible] dian occupancy.

Berwick and Nescop[illegible] in Indian mementoes, [illegible] were explored. From [illegible] Indian axes, tomaha[illegible] were taken. These, t[illegible] the big bones of the [illegible] Athens, were sent to [illegible] Museum, at Harrisbur[illegible] can Museum, New Yor[illegible]

A short trip [illegible] where a number of [illegible] Indian relics wer[illegible] West Branch will be [illegible] a thorough inspection [illegible] ing at Sunbury and [illegible] waters of the stream.

Many hundreds o[illegible] taken, surveys made[illegible] pages of notes taken. [illegible] pared and a history [illegible] maps and photograp[illegible] historical value will b[illegible]

# FLOODS TO [illegible] ON COTT[illegible]

## Higher Prices to [illegible] sult of Del[illegible] Sou[illegible]

*From Public L[illegible]*

NEW YORK, July 2[illegible] other members of t[illegible] will help pay the to[illegible] cotton mills by the f[illegible] the country, Worth [illegible] goods men said today. [illegible] mission house of any [illegible] the city has one or m[illegible] counts, while some of [illegible] the products of the Sou[illegible]

So serious was the d[illegible] mills, according to inf[illegible] the dry goods trade, [illegible] production of cotton [illegible] unfinished state would [illegible] average a week for ev[illegible] South, whether hit by [illegible] other words, it is esti[illegible] tity of cloths, runni[illegible] yards, which will be k[illegible] during the next month[illegible] to a week's entire pro[illegible] ern mills.

As this production [illegible] with, somebody has t[illegible] was said that it looked [illegible] do it by paying highe[illegible] dise it will buy over th[illegible]

The goods that will [illegible] interruption of manuf[illegible] include print cloths, sh[illegible] gabardines and other [illegible] jama and "athletic" [illegible] osnaburgs and cotton [illegible]

# SOUTH AMERIC[illegible] UNION UND[illegible]

## Brazil and Argentina [illegible] nomic Rap[illegible]

BUENOS AIRES, A[illegible] conference was held h[illegible] sider a project for eco[illegible] among South America[illegible] attended by Frederick [illegible] ican Ambassador; Ru[illegible] zilian Minister; the A[illegible] ister and several fo[illegible]

The Brazilian Amba[illegible] conference, saying th[illegible] tina should read a le[illegible] accomplished by the [illegible] Britain and France.

# [illegible] FINDS BY [illegible] OMMISSION

## [illegible] Harrisburg [illegible] ks in the Sus[illegible] Valley

*[illegible] to Public Ledger*

[illegible] 22.—The expedition [illegible] m K. Moorehead, of [illegible] Dr. George P. Done[illegible] cretary of the Penn[illegible] mmission, which has [illegible] of the Susquehanna [illegible] headwaters for the [illegible] ched this city. The [illegible] by the Pennsylvania [illegible] and the Museum of [illegible] of New York.

[illegible] n the North Branch [illegible] canoes, the canoeists [illegible]

[illegible] were opened in an [illegible] at Athens. It was [illegible] of the expedition, [illegible] nehoo. Portions of [illegible] nd which by their [illegible] chiefs were six and [illegible] said. According to [illegible] es it is an Andaste [illegible] e's cemetery. In [illegible] many of the graves [illegible] ere found crockery [illegible] cating a very early [illegible]

[illegible] d brass beads from [illegible] head were picked [illegible] chiefs were [illegible]

[illegible] wen to Waverly, [illegible] ill, supposed to be [illegible] ndian fortification, [illegible] evidence of it hav[illegible] be found.

[illegible] and Scranton and [illegible] Wyoming Valley [illegible] s were found. Near [illegible] e bed of the river, [illegible] streets were found. [illegible] Donehoo said, that [illegible] site and that the [illegible] outside each wig[illegible] bear and some that [illegible] o bones were found [illegible] down to a depth of [illegible] ame to signs of In[illegible]

[illegible] eck were found rich [illegible] and many town sites [illegible] each a wagonload of [illegible] rks and arrowheads [illegible] gether with some of [illegible] iant chiefs found at [illegible] he State Historical [illegible] g, and to the Ameri[illegible] k.

[illegible] ade to Lock Haven, [illegible] rivate collections of [illegible] ected. A trip up the [illegible] ade in the fall, when [illegible] will be taken, start[illegible] ing at Sunbury and [illegible] going to the head[illegible]

[illegible] photographs were [illegible] and thousands of [illegible] These will be com[illegible] of the trip with [illegible] s to illustrate the [illegible] e prepared.

# [illegible] EFLECT [illegible] ON MARKET

## [illegible] Consumer as Re[illegible] ay in the [illegible] h

*[illegible] ledger Bureau*

[illegible] 0.—New Yorkers and [illegible] e consuming public [illegible] taken of Southern [illegible] oods in that part of [illegible] treet wholesale dry [illegible] Virtually every com[illegible] size in that part of [illegible] re Southern mill ac[illegible] hem sell nothing but [illegible] thern manufacturers. [illegible] amage to the affected [illegible] ormation received in [illegible] that it was said the [illegible] loths in the gray or [illegible] be retarded on the [illegible] ry cotton mill in the [illegible] the floods or not. In [illegible] nated that the quan[illegible] ng into millions of [illegible] pt out of the market [illegible] or so, will be equal [illegible] duction of the South[illegible]

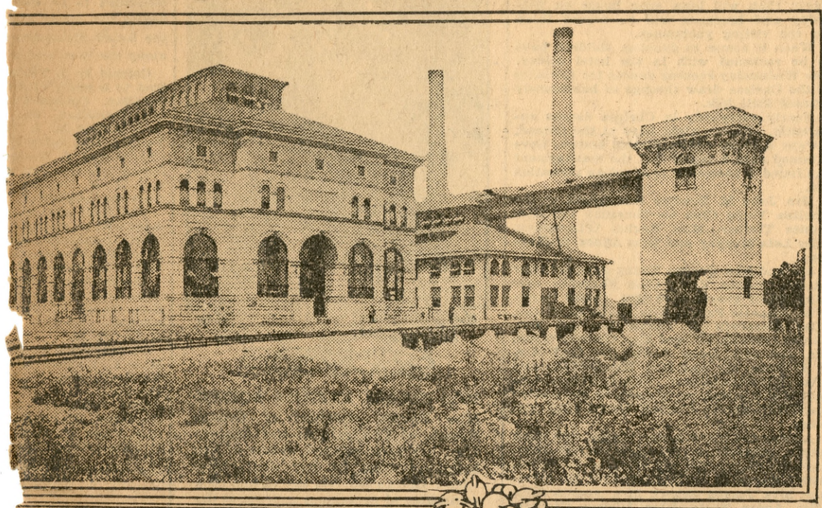
[illegible] cannot be caught up [illegible] foot the bill, and it [illegible] like the public would [illegible] prices for merchan[illegible] e counter next spring. [illegible] be hardest hit by the [illegible] acturing in the South [illegible] eetings, drills, twills, [illegible] fancy skirtings, pa[illegible] underwear fabrics, [illegible] luck.

# [illegible] AN TRADE [illegible] R DISCUSSION

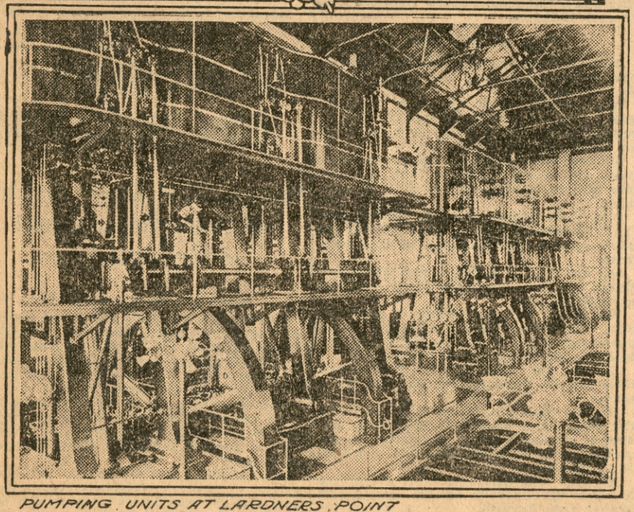
## Leaders for Eco[illegible] prochement

Argentina, July 21.—A [illegible] re yesterday to con[illegible] omic rapprochement [illegible] n countries. It was [illegible] J. Stimson, the Amer[illegible] y Barbosa, the Bra[illegible] gentine Foreign Min[illegible] er Cabinet members. [illegible] ssador addressed the [illegible] t Brazil and Argen[illegible] on in what has been [illegible] iance between Great

# VERWORKED PUMPS SHOW WASTE OF CITY'S WATER



[illegible] MPING STATION [illegible] CIPAL PUMPING [illegible] WORLD



PUMPING UNITS AT LARDNERS POINT

# ELECTRICAL BUREAU HEAD INVENTS NEW FIRE-ALARM BOX

## Keyless Door, It Is Believed, Will Reduce Sending in of So Many False Calls

CHIEF McLAUGHLIN, of the Electrical Bureau, has devised a new fire-alarm box which he believes will be more efficient [illegible] now in [illegible] and also reduce the [illegible] alls. The keyless [illegible] by the chief can be affixed to [illegible] present boxes at a cost possibly of less than $15 each, or a third of the price of the "safety" alarm boxes now on the market.

An interesting fact in connection with the device is that it was made in the miniature machine shop of the Electrical Bureau at City Hall, by employes of the city, according to the Chief's design. Describing the new box, Mr. McLaughlin said:

"The new keyless door has been designed to facilitate the transmission of alarms of fire, and also for the purpose of preventing the sending of false alarms.

"By simply pulling the lever on the outside of the box down, the signalling mechanism in the box is operated, and at the same time a local alarm is given on a loud-ringing gong mounted inside the door. This local alarm can be heard a block or more away and attracts the attention of the police or the citizens nearby to the fact that the box has been pulled, thereby discouraging the sending of false or malicious alarms.

"The new keyless door is quite simple and consists of very little mechanism. On a shaft containing the pulling lever, there is mounted a sector gear which works into the [illegible] on an escapement wheel and also [illegible] which [illegible] the [illegible] box.

"The escapement wheel operates an escapement which has an extended arm, on the end of which is placed a hammer that strikes the gong. Virtually all this mechanism, with the exception of the pulling lever, is located inside the outer door of the box.

"When the lever outside the box is pulled down the sector gear causes the escapement wheel to revolve, thereby operating the escapement and ringing the gong.

"Near the start of the downward motion of the pulling lever the box is tripped. The pulling lever, sector gear, etc., are brought back to their original positions by means of a spiral spring and during this return to normal position the gong also rings.

"The design of this keyless door is such that it can be applied to any type of the boxes used in this city.

"The idea of simplicity is one of the important considerations of the design of this new keyless door, and it is safe to say that it can be constructed at less than half the price of any keyless door on the market performing the same operations."

# WILD DENIZENS OF WOODS LURE THOUSANDS TO FAIRMOUNT PARK

## Population of Zoological Gardens Increased Recently by Large Number of Births

SOME ONE has said that Philadelphia on Sunday afternoon in summer may be called "the deserted city," but the mystery of where all the residents go has been solved. They are out in Fairmount Park, camping on the grass under the miles of beautiful shade trees, wandering up the romantic wooded valley of the Wissahickon to Valley Green, or strolling through the walks of the Zoological Gardens to study the little folk of the wood gathered there. Last Sunday more than 100,000 persons visited the Park and 3500 were at the zoo. All the youngsters from Manayunk to "Brewerytown" on the hill came down to see their friends in the cages and enclosures, and laughing children rode in the donkey carts through the mall and raced along the walks between the houses till twilight ended the happy day. "Shadowtail," as the Indians call the furry gray squirrel, said it was the gayest Sunday afternoon that he had known as he sat chattering in the sacred Chinese Ginkgo tree by the mammal house, and "Shadowtail," who has seen many years of children playing through the Park, is very wise.

Last week was "baby week" at the zoo. There were youngsters everywhere, small and weak and fretful, as all babies are when on parade, but they were the feathered and furred denizens of the yards and cages, and not the children of the grown-up folk. Perhaps the prize baby of all was the Prjevalsky youngster, the little wild horse that comes from the plains of Mongolia and the mountains of Tibet. The baby is a girl born July 5, and is doing well with her sleek little parents, that greatly resemble a pair of well-fed ponies. They have a long lineage, however, for these are of the species of Tartar horses that Attila's Huns rode when they came out of the East in the Middle Ages to sack the cities of Europe.

There are many other babies, too, in the Park. Three young seagulls form an interesting family, while many wobbly-legged little deer are learning to run about their pens. Mrs. Lizzie Garter Snake, at the reptile house, probably has the largest family of all, for she presented her spouse with 41 squirming babies the first of the week. Lizzie is well known in this neighborhood, having come from Manayunk only a few years ago, and all admire her unprejudiced views about birth control. Only the king snake, in the next cage in the reptile house, looks askance at the youngsters, for he, being a cannibal, has designs on their 41 lives.

Over at the monkey house Keeper James Crossman is having his hands full with the romance betweeen Villa and Sylvia Pankhurst. Sylvia is one of the prettiest little chimpanzeees east of Borneo, and stern-visaged old Pancho Villa in the next cage has always been her ardent admirer. On the Fourth of July Sylvia, who is British, stood the Yankee celebration as long as she could and then came down with a bad attack of the mumps. They locked her up in the keeper's office in quarantine and Pancho objected. He growled and shrieked and shook the bars, but poor Sylvia, who is slowly recovering, still sits sadly in her cage, staring pensively at her hero through the far-off door. Mimi is another lady of the monkey house with romantic instincts, but she, too, is kept in the office. She can stand on her head at command, clap her hands and shake hands. Mimi is a feminist of an advanced type and smokes cigarettes whenever she gets the chance.

This has hurt her reputation to some extent, and monkey gentlemen of the old school look a trifle askance at this advanced young woman. Johanna, 2d, is a feminist, too, and a bit of a militarist. Recently Congo, a gentlemanly chimpanzee, which has just arrived at the Park from Africa, was put in the cage with her. Johanna hasn't any use for the men and she pounced upon poor Congo and nearly chewed his ear off before keepers came to his rescue. He is in a separate cage now, and glares defiance at the "femme terrible" from across the bars.

Four years ago Bob got a lot of sympathy and a big reputation by developing tuberculosis. He was a very valuable monkey, and to save his life he was placed in an outdoor cage beside the Penn house for the fresh-air cure. Visitors came from all over the city to see him, but Bob has been shown up as a fraud. He still tries to look pathetic in his lonely cage, but the keepers declare that he was cured of the disease two years ago and his attitude of a romantic convalescent is all a fake. In the open cages surrounding the house there are several other monkeys, which have developed the disease and are taking the fresh-air cure, too, but Bob looks upon them as parvenus and usurpers of his rights and reputation.

Thousands will throng the Park today and will laugh at the antics of the half-human little creatures, but of those thousands only a few will be wise enough to know that the little folk of the woods have thoughts and feelings that are their own, and that in their hearts they may look at the grown-up folks and laugh too.

# WATER WASTED, DATESMAN AVERS

## Outlay of $20,000,000 Imperative Unless It Is Stopped at Once

## CAPACITY OF FILTRATION SYSTEMS IS LIMITED

### More Than 300,000,000 Gallons Pumped Through Pipes Every Day

Enormous outlays, amounting to $20,000,000 or more, will be necessary in the next few years to enlarge the filtration system, if water waste is not stopped. This estimate was made by Director Datesman, of the Department of Public Works, and Chief Davis, of the Bureau of Water. In this connection the Director said yesterday:

"The city cannot afford to make enormous outlays for unnecessary work and we must be prepared to reduce waste of water even to the extent of universal metering. As a matter of fact, we are wasting water with lavish thoughtlessness. The effective life of the present water works soon will be outgrown unless radical steps are taken to reduce unnecessary waste. We have the largest filtration and pumping system in the world; but there is a limit to what even these monster plants can turn out. The water works are filtering, pumping and distributing, through nearly 2000 miles of pipe, more than 300,000,000 gallons of water every day in the year. Recently 330,000,000 gallons were delivered in a single day or nearly 180 gallons for each man, woman and child in the city."

Arguing that such daily consumption of water is far in excess of actual needs for every possible requirement of shop or home, Director Datesman said the waterworks were more even than a business enterprise in that they constitute one of the essential foundations on which the entire life of the city is built.

"The waterworks," the Director said, "since Franklin's time have been identified and affiliated with the public health as well as with the commercial, industrial and domestic welfare of the community. The filter plants, pumping stations, distribution system and all the accompanying auxiliaries of a complete waterworks are the birthright of the coming generation, which should not be called upon to pass through the trials of their forbears to secure a clear, wholesome and satisfactory service to the most remote corners of the city."

Director Datesman in his talk on the urgent reasons why water waste should be stopped with least delay referred to the pre-filtration years when typhoid fever was an annual scourge in the city, and said the city's filtration system has reduced that disease to a minimum. "The sufficiency of the filtration system to meet the demands for water depends," the Director asserted, "upon whether the water is used reasonably or unreasonably.

"The recent loan authorizes $500,000 for the improvement and extension of the water[illegible]s. This will permit the installa[illegible] While we change our habits and turn from a careless to a careful community in the use of water.

"In any event, the waterworks must be strengthened at weak points and enlarged to meet the normal growth of the city. Express mains must be laid to carry water direct to South Philadelphia, so that the supply in that district may be adequate. The coming development in the northeast must be anticipated. The Fairmount dam must be replaced. These and other features must be provided for in the next loan.

"It behooves us to consider whether we desire to save our inheritance in the shape of the waterworks, or let it run to waste, merely because we forget what it cost in both human lives and happiness, and in dollars and cents."

# INDEPENDENT GUARD WILL GO INTO CAMP

## First Regiment of American Order to Use Grounds of Speedway Association

About 400 of their number already in service on the Mexican border, the remainder of the force of more than 1200 men who comprise the 1st Regiment of the Order of Independent Americans Guard will go into camp on the grounds of the Philadelphia Motor Speedway Association at Warminster, Pa., during the week of August 5.

This organization, which is made up of members of the Order of Independent Americans in Pennsylvania, formed as a regiment on May 11, 1914, at the time of the first trouble with Mexico.

It was offered for service in the second line of defense to the War Department of the National Government. On June 1 the membership in the regiment was 1285, although 400 of the men were at the front with the various National Guard regiments from this State.

The necessity of similar opportunity for instruction as enjoyed by the guardsmen of the State led to negotiations with officials of the Philadelphia Motor Speedway Association, and the immediate result was the offer of the use of the speedway property above Willow Grove as a camping site.

Army officers probably will inspect the reservists while they are in camp. It is anticipated that should there be a call for volunteers, the force would be immediately mustered into service. The camp will be known as Camp Dickinson, and will be in charge of Colonel William D. Single, the regimental commander.

The staff officers at the camp will include: Lieutenant colonel, J. F. Welden, ex-member of 1st Regiment, N. G. P.; regimental adjutant, A. C. Diehl, ex-member of 2d Regiment, N. G. P.; regimental surgeon, Dr. Thomas Matlack, of St. Luke's Hospital; first assistant surgeon, Dr. J. H. Smith, of Hahnemann Hospital; second assistant surgeon, Dr. J. P. Mayer, of Children's Hospital; third assistant surgeon, Dr. R. Liggett, of Medico-Chirurgical Hospital; regimental chaplain, the Rev. George W. Tyron, of Tacony Baptist Church; regimental inspector, Andrew J. Mannal, of Girard College staff (ex-member); regimental quartermaster, Ferns E. Griffith, of E. F. Griffiths, Philadelphia manufacturer, and regimental commissary, Frederick Hollmuller, of Hollmuller & Son, wholesale food products.

## FRENCH CATTLE INCREASE

PARIS, JULY 21.—A census of farm animals up to July 1, made by the Agricultural Department, shows that cattle generally have increased compared with a year ago, while the number of sheep and hogs has diminished appreciably, which explains the continued high price of mutton and pork.

A comparison in round figures of the number of farm animals in 1916 with 1915 shows the following:

Cattle, 12,724,000, against 12,287,000; sheep, 12,079,200, against 13,483,000; hogs, 4,448,000, against 5,491,000; horses, 2,317,000, against 2,227,000; mules, 479,500, against 484,500.

(COPY)

DEPARTMENT OF LAW, CITY OF PHILADELPHIA.

March 28, 1907.

In re. Water supply, Roxborough District.

J. R. Hathaway, Esq.,

Director, Department of Public Works.

Dear Sir:

I beg to acknowledge the receipt of your letter of the 5th inst., enclosing a letter from E. F. Smith, General Manager of the Schuylkill Navigation Company, and the report of A. J. Fuller, General Superintendent in charge of the Bureau of Water, to you, relative to the right of the City of Philadelphia to pump water from the pool at Flat Rock Dam for the use of its citizens. Mr. Fuller's report is as follows:

"The City has been supplying Germantown and Chestnut Hill (which lie partly within the Delaware warer shed), with water taken from the Flat Rock pool, for 40 years, and from 1871 until a short time ago, Tioga has been supplied from the same source. It now, however, receives water from the Queen Lane system.

At present it is proposed to go back to the original source and supply Tioga from the Roxborough works. I know of no reason why this should not be done, unless there is some question of law involved, which, however, must apply equally to all other sections of the Delaware water shed, now supplied with water from the Schuylkill river. Any such question should be settled by the Courts, but the possibility of a recourse to such a settlement should not delay the construction of the proposed mains to supply Tioga.

I recommend that both this question and also the right to furnish Schuylkill water to manufacturers be referred to the City Solicitor."

Mr. Smith in his letter to you says:

"It having come to my knowledge that the Bureau of Water, of the City of Philadelphia, is about to lay a line of pipe for the purpose of supplying the Tioga District with filtered water from the Upper Roxborough Filtration Plant, I deem it my duty to advise you that the city has no legal right to pump water from the Schuylkill river for the supply of sections of the city lying within the Delaware water shed, and more especially when this water is sold to consumers for manufacturing purposes.

This is clearly an invasion of the right of the Schuylkill Navigation Company to use or sell the water power of the river, a right which it has exercised continually since the year 1819. (See Act of Incorporation dated the 8th day of March, 1815, Section 15), and for such a diversion the city would be liable in damages.

The Schuylkill Navigation Company has been lenient and disposed to overlook the many violations of the agreements of the 3rd of June,1819, and 14th of June, 1824, on the part of the city in the operations of its pumping stations on Fairmount Pool,but it is not disposed to pass unnoticed any further trespass upon its rights in the operations of the Roxborough Pumping Station on Flat Rock Pool.

The City of Philadelphia has no right whatever to the use of the pool of Flat Rock Dam, as maintained by the Navigation Company, either by agreement, or by obligation on the part of the Navigation Company to maintain a dam or keep the water at its present elevation.

Whilst there is no desire at the present time to interfere with or impede in any way the proposed diversion of water to the Tioga District, and especially when it is done to relieve the distress caused by a Typhoid epidemic, yet I think you will agree with me that it is better that the effect of such diversion upon the rights of both parties, should b e fully understood."

The question thus raised by Mr. Smith is: Has the city a legal right to pump water from the Schuylkill river at Flat Rock Dam, for the supply of sections of the city lying within the Delaware water shed for domestic and commercial uses?

If it has such right, the other suggestion contained in Mr.Smith's letter:- The liability of the city to answer in damages for such diversion need not be considered at any length.

The citizens of Philadelphia living within the Schuylkill water shed have the inalienable right to the unqualified use of the waters of the Schuylkill river for purely domestic purposes, and if the occasion requires it, may take from the river for such purposes all the water it contains,even though the works of the Navigation Company should thereby be rendered useless for the purposes of navigation,inasmuch as the use of water for man and beast is paramount to all other uses. This, as I have said, is an inalienable right,and therefore cannot be divested by legislative authority or otherwise. The waters of a stream,however,cannot legally be diverted to points outside the water shed so as to interfere with the right of the people of the State to navigate the stream from which it is taken, unless there be legislative sanction for so doing. And where the water is applied to purely commercial uses within the water shed,those responsible for such use are liable to answer in damages to those whose

right to navigate the stream has been interfered with. Thus far I have considered the question with reference to the natural rights of persons, individually or collectively, as distinguished from rights acquired from the State. With reference to these acquired rights it may be said, that the city's title to the use of the water antedates the right of the Navigation Company to construct its works under the Act of March 8,1815, by which it was chartered.

The city first began to use Schuylkill water for the supply of its citizens in 1801, a pumping station being located at Chestnut Street wharf, Schuylkill. By Act of April 9, 1807, P.L. 189, the Legislature granted to one ,Robert Kennedy, the right to maintain a dam near the Falls of Schuylkill. The Act provided: "That if at any time hereafter, the corporation of the City of Philadelphia shall be desirous of erecting any works or machinery for the purpose of conducting the waters of the said river to the said city, the right so to erect is hereby reserved, but if, by such erection, the works of the said Robert Kennedy shall be materially injured or destroyed, the said corporation shall be liable to pay the whole of the reasonable expenses incurred by the said Robert Kennedy, together with twenty per centum thereon for his trouble and disappointment, on due conveyance being made for the whole of his right in the premises." Kennedy subsequently conveyed his right therein to others, who in turn sold it to the city in 1818 for $150,000.

At the time of the passage of the Act of 1807, the City of Philadelphia was located between the Delaware and Schuylkill rivers, and between South and Vine streets. It thus appears that the Legislature authorized the City of Philadelphia to use the water of the Schuylkill, not only for its citizens residing in the Schuylkill water shed, but in the Delaware shed as well. And further, it may be presumed that the Legislature contemplated the growth and development of what was then, perhaps, the largest and most important city in the United States, and that water from the

Schuylkill would be supplied to territory beyond the boundaries of the city as then existing. In 1843 (Act of April 18, 1843, P.L. 304), the Legislature also authorized the incorporated Districts of the County of Philadelphia to "construct steam or other suitable works on or adjacent to the Schuylkill river, at any point between the south line of Coates street and the northern boundary of the District of Spring Garden, or in such other suitable location as they may deem expedient, for the purpose of pumping and supplying said Districts and the inhabitants thereof with water from the said river, or such other stream of water in the vicinity of said Districts as may be found practicable." By the provisions of the Act of February 2, 1854, P.L. 21, consolidating all the Districts in the County of Philadelphia with the old city, the City of Philadelphia, as now existing, was vested with "all the powers, rights, privileges and immunities possessed and enjoyed by the several separate municipal corporations within the County of Philadelphia."

It will thus be seen that the City of Philadelphia has been expressly authorized by the Legislature to divert water from the Schuylkill river to sections of the City which are located outside of the Schuylkill water shed, and hence it may very properly supply the Tioga District with filtered water from the Upper Roxborough Filtration Plant, even though the water is to be furnished in part to consumers for manufacturing purposes. Neither the Act chartering the Schuylkill Navigation Company nor any other Act of Assembly pertaining to said Company, vests it with the exclusive right to "use or sell the water power of the river," if it be the intention of that Company to claim that its powers thereunder are paramount to the right of the City to take water from the river for the accommodation and use of its citizens domiciled or engaged in business in the Schuylkill or Delaware water sheds. Having the right to take water from the river at any point in its discretion, the City may take it from the vicinity of Flat

Dam, even though it will thereby pump water accumulated by the Schuylkill Navigation Company in connection with the operation of its works. For purely domestic purposes the City may pump the Dam dry without any liability to the Navigation Company or others. If the depth of water should be reduced so as to interfere with the navigation of the stream, the City, under the cases, might be liable to answer in damages to the persons deprived of its use as a public highway, but I know of no authority for holding that such act would be "an invasion of the right of the Schuylkill Navigation Company."

Yours very truly,

JOHN L. KINSEY,

City Solicitor.

First Engine House, City Water Works - Philadelphia.

(Legend to Photograph, by McClees, from drawing by Breton, 1824, at Philadelphia Library.)

Between the edifice in the above photograph and the River Schuylkill, there was constructed of stone masonry, an extensive basin or reservoir protected by high embankments of earth surmounted by a pale fencing, which was kept constantly filled with water by means of flood gates to the river, upon the immediate margin of which they were extended. From this basin the water was admitted to a well within the house and from thence it was pumped up by Steam-power to a reservoir at the top of the house. The water was then impelled by its own gravity through a tunnel (a broken section of which is visible beneath the tree in the picture) eastwardly through Chestnut St. to Broad St. - then northwardly to the Centre Square engine house at the intersection of Market and Broad St. The tunnel was constructed with hard brick, six feet in diameter. At the Central engine house the water was again raised by a steam engine to a receptacle at the top of the interior of the house, after acquiring this "head" it flowed through main pipes and thence throughout the city.

Note - the space in front of the picture, (dark colored) represents Chestnut St. The surface of the earth was upwards of 20 ft. above the present level (1857) of Chestnut and Schuylkill Front, now 22nd St. and the then height from the water level (river) over 80 feet. I do not mean to be quite accurate in this, judging from memory.

(1857)

DEPT. OF PUBLIC WORKS
RECEIVED
SEP 1883
No. 3983.
PHILADELPHIA



No. 417 Walnut Street,
Philadelphia, January 15th, 1883.

*To the Commissioners of Fairmount Park.*

Gentlemen:—

The results of the analyses of the samples of water taken from the forebay at the Fairmount works, on January 9th, 1883, show that the water pumped on that day was unwholesome. Comparisons with results obtained in former years, under the same conditions of the river and weather, make it evident that the contents the pool of the of Fairmount Dam, during the periods of low-water and ice-covering, are unfit for distribution for household purposes.

Other conditions being similar, the amount of albumenoid ammonia obtainable from waters may be assumed to express their comparative contamination or unwholesomeness. Analyses made of the water in the pool in the periods of apparently worst condition in 1881 and 1882, and the analysis just made in 1883, give the following amounts of albumenoid ammonia in each 1,000,000 parts of water:

| YEARS. | PARTS. |
|---|---|
| 1881 | 0.373 |
| 1882 | 0.361 |
| 1883 | 0.524 |

as compared with 0.106 and 0.093 parts as the best results obtained during 1881 and 1882.

As 0.16 to 0.2 parts of albumenoid ammonia in 1,000,000 parts of water represents (in water containing free ammonia) the greatest amount allowable for a wholesome water, it is apparent that during each of the years named the water supply of this city has been in very bad condition, and that the depreciation at the present time is much greater than during the years 1881 and 1882. The presence of hurtful ingredients does not necessarily give to the water an unpleasant taste or odor; in fact the most dangerous waters have often the clearest, most brilliant and sparkling effervescence. Two conditions are necessary for the sudden production of the large amount of offensive vegetable growth that now appears in our river water.

First, the presence of animal matter, such as is derived from cesspool drainage, animal refuse from manufactories, and offal from slaughter houses.

Second, the absence of strong currents and a condition of quietude in the body of water in which such growth occurs.

The influx of animal matter into the Fairmount dam is going on at all times and seasons, and when the flow of water is so diminished that there is no overflow on the dams, the pools then become stagnant bodies of water, in which the percentage of hurtful ingredients increases. The cessation of navigation in the canal renders the current sluggish and the surface undisturbed, and "drawing off" the dams sends down a large amount of decaying organic matter, which, when the river is covered with ice, adds materially to the trouble.

The best condition of the water as to freedom from organic impurity is just after a freshet, by which the river bed has been thoroughly scoured out, a remedy

that is usually followed by the distribution of muddy water for a considerable time. The circumstance of an unpleasant taste in the water is not of recent origin, but is referred to in a " report of a Special Committee of the Commissioners of Fairmount Park," upon the preservation of the purity of the water supply, presented to and approved by your Commission on October 11, 1867. It is there noted that the water supplied to New York, Boston, Albany, Brooklyn and New Haven had been similarly affected.

The same report also treats of the remedies to be applied, and recommends the laying down of sewers upon the banks of the river to carry off the foul drainage below Flat Rock dam, and also urges the building of large distributing basins and of a storage dams or lakes, by means of which the surplus flow of the river can be arrested and kept for gradual use. *Had these recommendations of your Commission been promptly acted upon, the present troubles would have been long postponed.*

The various odors given out by the drainages from gas and oil works are far from pleasant; they are, however, not unwholesome or injurious, and at the present time may be of some service, as they contain substances calculated to prevent the decay which feeds the offensive vegetable growths. When the ingress of animal matter is prevented, all drainage from gas and oil works should also be stopped. *The root of the present trouble is in the drainages containing animal matter. These sources of pollution should be promptly stopped, and in this way a wholesome water will soonest be obtained; and I understand wholesomeness to be the essential qualification to be secured in the selection of a water supply for domestic use.*

I cannot suggest any more practical and prompt remedy than the immediate exclusion of cesspool and slaughter-house drainages and animal refuse from factories; the minor matters of interest sent in by the gas and oil works and paper factories can be disposed of more leisurely, as this exclusion is not so essential as is that of the others named.

A source of pollution of our water supply in the mains, not chargeable but occasionally charged to the water of the river, comes from the introduction of various animal, vegetable and mineral matters from boilers and digesters with which the mains are directly connected by the service pipes. This pollution is not purposely or knowingly caused, but is the result of an improper connection directly with the mains.

Failure to secure legal intervention to prevent the introduction of hurtful matter into the pool of Fairmount dam will soon prevent its use as a source of supply. The Delaware river has been so fouled by the sewage sent into it that the water is now in far worse condition than that in the Schuylkill river, and this condition exists for many miles above the city.

* * * * * * * *

Respectfully,

CHAS. M. CRESSON, M. D.

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# THE SCHUYLKILL WATER SUPPLY.

## A REPORT MADE IN REFERENCE TO THE SCHUYLKILL WATER SUPPLY IN 1887.

In discussing the question of the water supply of Philadelphia, since the publication of my letters, which were read before the Water Committee of Councils last week, the assertion has been made that "the present supply of water from the Schuylkill river is not polluted with sewage to such an extent as to be dangerous to health."

It was also said that the general returns of mortality and of the diseases which cause death are such as show that the health of Philadelphia is comparatively good.

These assertions are not warranted by the facts, and it is proper that the public should know what real risks ensue from a continuance in the use of the Schuylkill river as a source of water supply.

It has been my duty for the past fifteen years to make frequent examinations of the water supplied to the city of Philadelphia, and during the past ten years repeated notifications have been given that the water of the Schuylkill at the several inlets to the pumping stations is not an *uninterruptedly unpolluted water*.

In 1883 it was stated in my report on the condition of the water supply, that the water pumped at the Fairmount Works was "*unwholesome*," and that unless

measures were taken to prevent the introduction of hurtful matters into the pool at Fairmount dam, that source of supply must soon be abandoned, and "that recourse must be had to other localities."

Unfortunately, efficient measures have not been taken to exclude damaging matters from the pool of the dam, and of necessity the recourse to other sources has become imperative.

The intercepting sewer has been constructed of such small dimensions that it cannot carry the surface drainage from the Park and cemeteries on the banks of the river, to say nothing of the present factory refuse for which it was designed.

Meanwhile the rapid increase of factories and population consequent upon the completion of competing railroad facilities in the Schuylkill valley has augmented, and will further augment, the already enormously increased drainages flowing into the river for miles above the Flat Rock dam.

The water in the Flat Rock dam has already been contaminated, at times, to such a degree that it is occasionally "unfit for use," and my recommendation in a report to the Park Commission, of January 30th, 1883, that "means be provided for the interception and conveyance of sewage from Norristown," should, in the light of what has since occurred, have included an extension of the intercepting sewer to a point many miles above that borough.

*The condition of the problem of protection, developed at the present time, fully demonstrates that the attempt to secure and maintain the purity of the Schuylkill water by intercepting the contaminating agents is no longer feasible.*

The liability of water to carry some of kinds disease is no longer a subject of doubt or discussion.

When the excreta of patients suffering from typhoid fever or cholera are put into waters which are in a certain chemical condition, something derived from the presence of the excrement is carried by the water, whereby the disease can be communicated to persons who may drink of it.

Whether this "something" is a germ or not is immaterial to our present purpose, for beyond doubt the communication of disease has frequently been effected in this manner by water supply.

I do not assert, however, that water which is polluted by sewage generates typhoid fever or cholera, but I am decidedly of the opinion that sewage is capable of producing a condition in water whereby the carriage of disease can be promoted.

Not every individual who drinks water "unfit for use" is necessarily inoculated with disease, but only those who may be predisposed from some other cause.

Persons suffering from intestinal diseases tending to diarrhœa, either have the disease developed or increased in violence by the use of polluted water, and surely precautions should be taken to protect the community from this danger, as well as from the more fatal epidemics of cholera and typhoid fever.

*The water of the Delaware river was at one time equally as good as that from the Schuylkill river, but opposite Philadelphia it now has depreciated to that extent that where the Kensington supply is taken it is acknowledged to be not only unwholesome but in a condition to promote disease.*

The depreciation in the quality of the Delaware

river water has been caused by the influx of city sewage, and the water of the Schuylkill is daily depreciating from a precisely similar cause; and already in Flat Rock pool it is inferior to the Delaware at Lardner's Point (see Mallett's Report), and *before long the typhoid district may extend over the area supplied from the Schuylkill as it has over that deriving its supply from the Delaware river at Kensington.*

It will require many months, probably several years, to make the preparations necessary to introduce a new supply of good water; meanwhile, *should an epidemic occur nothing remains but an endurance of the scourge.*

This being the state of affairs, is there not necessity for prompt action in the selection of some better source of supply, and in the erection of works for its conveyance to the city?

Yours, respectfully,

CHAS. M. CRESSON, M. D.

Philadelphia, January 12, 1887.

A

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[REPRINTED FROM THE "PRESS" MARCH 19TH, 1889.]

*413 Locust Street.*
*Philadelphia, March 15th, 1889.*

In the published report of the proceeedings of the Germantown Horticultural Society, I find statements by Prof. Thos. Meehan in reference to the quality of the water of the Schuylkill River, and as to the bearing of its quality upon disease. These statements are seemingly based upon several conditions set out by Mr. Meehan.

He says: "*Now it is bacteria in Schuylkill water, and no one thinks of talking about an overplus of the albumenoids.*"

The fact is that the amount of albumenoids carried by the Schuylkill water has been steadily on the increase so that during the last year Schuylkill water rivals in impurity the water of the Delaware in front of the city, and is sometimes excelled in quality by the water of the Delaware River at Lardner's Point.

The "*albumenoids*", to which Mr. Meehan refers, during the month of January amounted to as much as 0.575 parts in 1,000,000 in water delivered from the street mains and filtered, an amount of albumenoid ammonia which would absolutely condemn any water, as being unfit for use, even when it is measured by the most liberal standard for allowable impurity.

Several examinations of the water supplied from Chestnut Hill Spring showed the presence of household

drainage in considerable amount, and it was found that drainage of that description was flowing into the source from whence the water was pumped.

Investigation also disclosed the fact that the use of an underground system of drainage for waste and water-closet wash, had introduced pollution into the underground sources from which the wells in the neighborhood obtained their supply of water.

In another instance, in the Germantown District, a pump-well was converted into a cess-pool, and in consequence the wells in the neighborhood which drew their supplies of water from the same source were polluted.

The following table from the official records of the Board of Health shows at what seasons of the year Typhoid Fever is most prevalent in Philadelphia:

1888 CASES OF TYPHOID FEVER REPORTED TO BOARD OF HEALTH.

| | | | |
|---|---|---|---|
| January | 185 | July | ***447*** |
| February | 192 | August | 290 |
| March | 200 | September | ***628*** |
| April | 290 | October | 378 |
| May | 306 | November | 190 |
| June | 244 | December | 232 |

A glance at this table will show the incorrectness of Mr. Meehan's statements—"*February and March in every year are the seasons the disease prevails generally in Philadelphia.*"

"*We have the most Typhoid Fever when there is the least Schuylkill water drank. In the hot and dry months when the Schuylkill water is in everybody's mouth, our city is nearly free from Typhoid Fever.*"

Mr. Meehan's statements seem to me to be in direct opposition to the facts.

In pursuance of an investigation of the subject of Typhoid Fever and other diseases in this city, I have obtained information from other sources, and among them from the Health Departments of several cities the ratio of deaths from Typhoid Fever to population during the past four years, selected from which are the following:—

| | Deaths—one in each. | | | | Deaths in each 100,000 of the population in 1888. |
|---|---|---|---|---|---|
| | 1885 | 1886 | 1887 | 1888 | |
| New York . . . . | 4752 | 4491 | 4656 | 4243 | 23.5 |
| Baltimore . . . . | 2691 | 2871 | 2802 | 3107 | 32.2 |
| Boston . . . . . | 2612 | 2693 | 2186 | 2441 | 40.9 |
| Chicago. . . . . | 1270 | 1458 | 1989 | 2213 | 45.1 |
| PHILADELPHIA . . | 1563 | 1580 | 1610 | 1307 | 76.5 |

The death rate from Typhoid Fever in Philadelphia in 1888 is the highest of any of these cities. It is 70 per cent. worse than the worst in the table, and 225 per cent. worse than the best. The number of deaths in Philadelphia from Typhoid Fever in 1888 was 783.

Careful observation and comparison have shown a positive connection between the cases and deaths from this disease with the condition of the water supply.

Whatever may be the exact cause of the disease (whether bacteria or not), its mildness or severity is evidently connected with the rise and fall of, and carriage of material by, our water supply.

If the death rate from Typhoid Fever in Philadelphia could have been reduced to that of the city of New York, there would have been a diminution of over 2000 cases of sickness, and over 500 in the annual summary of deaths, from that disease.

CHAS. M. CRESSON, M. D.

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[Reprinted from the "PRESS" of June 16th, 1889.]

# Extracts from Memoranda made by Dr. Charles M. Cresson Relative to Water Supply and Disease in the City of Philadelphia.

**The present communication refers to the relation of Water Supply to Typhoid Fever only.**

## I.

The ratio of deaths from Typhoid Fever in Philadelphia in each million of inhabitants for the year 1888 was

For that part of the city chiefly supplied from the Delaware River:—

| | |
|---|---|
| Lardner's Point | 763 deaths. |
| Kensington (Otis Street) | 1,190 " |
| Spring Garden Works, direct pumpage from the street mains | 706 " |
| Best ratio was from a district supplied from the Schuylkill by means of reservoirs | 607 " |

During the first three months of the year 1889, the district known as Kensington was largely supplied with water from the Schuylkill River, and the death rate of that district was below 700 in the million, in the place of 1190, which was the rate for the year 1888 when Delaware water was supplied.

The quality of water sent into parts of this district has been exceedingly variable, and the variations are principally due to the irregular injection of water into the mains from the Delaware River, either in fractional part or in whole. Upon one day in April last, water drawn from a hydrant in the Nineteenth Ward gave .137 parts of albumenoid ammonia in the morning, .192 parts at noon, and .247 parts at night.

The analyses of the samples of water were made after they had been set aside twelve hours or more to allow of the "settlement" of the suspended material, but the samples were not filtered and were examined in the condition in which they were used by a majority of the consumers of water.

Since the 1st of February the water in the Delaware River has been in an unusually foul condition, not only opposite, but above and below the city of Philadelphia; in fact, the quality

of the water of that river has been continuously bad and unfit for use. Early in last January I discovered in the water of the Schuylkill River, in the Flat Rock Dam, organisms which corresponded in description with those found in the evacuations of patients suffering from Typhoid Fever. The presence of this material was traced as far up the river as Norristown, which is situated about eight miles above the Flat Rock Dam. These organisms were soon afterwards discovered in the water pumped direct from the Schuylkill River, and finally in that supplied from all of the basins excepting those of the Fairmount Works. Within a few days after this discovery the reports to the Board of Health showed a great increase in the number of *cases* of Typhoid Fever; soon afterwards the number of *deaths* recorded from Typhoid Fever were also greatly increased.

The following tables show the weekly returns:—

| | | CASES. | DEATHS. |
|---|---|---|---|
| 1889. | January 5th | 58 | 10 |
| | " 12th | 58 | 10 |
| | " 19th | 118 | 8 |
| | " 26th | 192 | 10 |
| | February 2d | 129 | 25 |
| | " 9th | 82 | 18 |
| | " 16th | 108 | 21 |
| | " 23d | 96 | 18 |
| | March 2d | 143 | 18 |
| | " 9th | 80 | 21 |
| | " 16th | 79 | 8 |
| | " 23d | 60 | 14 |
| | " 30th | 47 | 18 |
| | April 6th | 74 | 7 |
| | " 13th | 58 | 11 |
| | " 20th | 67 | 8 |
| | " 27th | 50 | 15 |
| | May 4th | 48 | 10 |
| | " 11th | 63 | 9 |
| | " 18th | 72 | 17 |
| | " 25th | 78 | 15 |

At the commencement and during the continuance of this epidemic of Typhoid Fever, the quality of the water as determined by chemical tests was occasionally good, but generally in doubtful, and frequently in very bad condition.

The chemical test of the quality of water chiefly determines the presence of decaying animal matter, and shows whether or not the organic matter is probably derived from cesspools.

It is not believed that the impurities in the water *generate* Cholera and Typhoid Fever, but that the presence of decaying

material causes the water to take an alkaline condition, a condition necessary for the preservation of the life of the organisms which carry those diseases. The decaying material however promotes the occurrence of other diarrhœal diseases, the nature of which other diseases will be discussed at a future time.

When it is evident that the source of pollution is from cesspool drainage, then there is a liability at any time of the production of an epidemic of Cholera or Typhoid Fever, by the introduction into the water supply of the dejecta of patients suffering with these diseases; such was the cause of the epidemic of Typhoid Fever which commenced in January last, to wit: the introduction of the dejecta of Typhoid Fever patients into the Schuylkill River at Norristown.

I have seldom failed to find evidence of the presence of Typhoid Dejecta in the water of the Delaware River; mechanical concentration of the sedimentary material of a considerable bulk of water being an essential to the success of the examination.

In the consideration of the effect of water supply upon health there are three distinct lines of investigation to be followed:—

*First.*—As to the presence and the amount of decaying and decayable matter carried by the water.

*Second.*—As to the organisms present which carry zymotic diseases.

*Third.*—As to the presence of substances or organisms which produce diseases by mechanical violence.

The first of these investigations is made by chemical means.

The second and third by the microscope and by the methods of biological inquiry.

Daily examinations have been made of the quality of the water supplied to parts of the city for the past eighteen months and samples have been preserved, and of these there is not one which shows absolute freedom from sedimentary matter, and some of them are so foul that a stratum of water two inches in thickness completely prevents the transmission of light. The quality of the samples at times has been fair, but more frequently doubtful or unfit for use.

It has recently been stated that no systematic examinations of the water supply have been made. This statement is not correct. During the past seventeen years periodical examinations have been made of the water supply and reports upon its condition, under resolutions of the Commissioners of Fairmount Park.

The first object to be attained by these analyses was the discovery and location of the sources of pollution; and the results of analysis determined, in very many instances, the action of the Park Commissioners in the removal of the local causes of pollution.

The Park Commissioners require analyses to be made of the water in the several forebays or inlets to the pumping stations, and the results of this work are recorded in books which are kept at the offices of the Park Commission, Water Department, and Health Office.

For several years analyses have been frequently made of the water supplied to various locations in the city, and for many months this has been a daily practice. The records of the analyses of the water supplied by hydrant in the several districts of the city are kept in my own possession, having been made entirely at my own cost, but they have been freely used for public information from time to time. To increase the value of the records of analyses, and to enable ready estimation of the quality of the water upon the health of the consumers, I have had careful count made of the dwelling-houses erected and of those abandoned (and for each ward separately during the years from 1874 to 1889), for the purpose of ascertaining correctly the population of each district of water supply from time to time, and I have made tabulated statements from time to time from the records of the Board of Health for the years 1861 to 1889.

The water supply to Philadelphia is now, and has been for years past, derived partly from the Schuylkill and partly from the Delaware River opposite to or near the city. A portion of the Schuylkill supply has been pumped into reservoirs and from them distributed, but another portion has been pumped directly from the river into the street mains for distribution, without an opportunity for the separation of large percentages of floating or suspended matter by the operation of "settling." A third portion of the water supply has been taken from the Delaware River, into which the chief part of the sewage and drainage from the city of Philadelphia and that of Camden is freely run.

The operations of settling and filtration have each and both advantages over the use of the water direct from the river. But the definite consideration of the benefits to be derived by either or both treatments, cannot now be detailed.

Information derived from the health authorities of other cities, as to the ratio of deaths to population in the year 1888 from Typhoid Fever, shows the following results:—

DEATHS IN THE MILLION OF INHABITANTS.

| | | | |
|---|---|---|---|
| Pittsburgh | 868 | Milwaukee | 348 |
| Memphis | 810 | Baltimore | 322 |
| Philadelphia | 766 | Newport | 318 |
| District of Columbia | 671 | St. Louis | 295 |
| Indianapolis | 666 | Worcester | 270 |
| Louisville | 665 | Lynn | 260 |
| Fall River | 661 | Taunton | 250 |
| Cincinnati | 624 | Pawtucket | 240 |
| New Haven | 500 | New York | 235 |
| Hartford | 490 | Brooklyn | 188 |
| Cleveland | 480 | New Orleans | 188 |
| Chicago | 451 | Atlanta | 161 |
| Rochester | 450 | Philadelphia, worst district | 1190 |
| Boston | 409 | " best " | 607 |
| Peoria | 375 | London, England (1887) | 145 |

If it were possible to dispense altogether with the use of water from the Delaware River opposite or near to the city of Philadelphia, and substitute that pumped from the Schuylkill River into basins and properly settled, the death rate could be greatly reduced. But if it were possible by a change in source of water supply to reduce the death rate for Typhoid Fever in Philadelphia to that of London, England, more than 550 lives could be saved annually.

If the death rate in Philadelphia from Typhoid Fever for the year 1888 could have been reduced to that of New York City, not less than 500 lives would have been saved, and this result could have been effected by the expenditure of far less capital than was recently expended by New York City for the purpose of improving a water supply already in better condition than that of Philadelphia.

Evidence of the great advantage to be derived from the substitution of an occasionally fair water supply for one that is continuously bad is shown by the record of cases and deaths from Typhoid Fever in one of the northeastern wards in Philadelphia.

The cases and deaths reported in successive weeks from January 5th, 1889, were as follows:—

Cases . . . . . 0, 3, 5, 3, 1, 0, 4, 6, 7, 0, 2, 5, 2, 1, 3, 8, 6, 2, 10, 4, 19—(91)
Deaths . . . . 0, 0, 1, 0, 2, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 2, 1, 1, 1, 2, 0—(13)

The injection of Delaware water during six weeks has given a continuous record upon the death roll.

In another ward supplied from the Delaware River the record shows as follows:—

Cases . . . 3, 9, 2, 6, 3, 3, 10, 11, 11, 10, 7, 4, 4, 9, 8, 11, 4, 6, 3, 5, 2—(131)
Deaths . . 1, 3, 0, 0, 0, 0, 2, 0, 3, 2, 3, 3, 1, 1, 2, 2, 4, 4, 1, 1, 3—(36)

In the first instance the water supplied was chiefly from the Schuylkill River, until within the last eight weeks, when it was mixed with that of the Delaware River in varying proportions.

In the second instance the water was from the Delaware River, and the average death rate since the first of January last was 2700 deaths to the million of population.

The death rate in one district supplied for the same period from the Schuylkill River was less than 500 to the million.

It is therefore evident that the water of the Delaware River opposite to the city of Philadelphia (even when taken at Lardner's Point) is never free from organisms capable of communicating Zymotic disease.

It is also evident that the water of the Schuylkill River carries a smaller amount of the same organisms, which are liable to be increased in amount periodically. (Except that since January, 1889, the water at Flat Rock Dam has been almost continuously charged with organisms derived from patients suffering from Zymotic diseases at Norristown, Conshohocken, &c.)

The Delaware River receives the household drainage from about 700,000 individuals, and the Schuylkill River above the Fairmount Dam receives that from not less than 200,000 individuals.

Taken altogether, the records of the Health Board show a very decided advantage in favor of the complete substitution of the water of the Schuylkill River for that from the Delaware.

The fatal results of the epidemic of Typhoid Fever commencing in January last, *in the districts supplied from both rivers, show the absolute necessity for the selection and adoption of a new source for water supply as soon as possible.*

There is no doubt that a great improvement in the quality of the water from the Schuylkill River can be made by settling and by filtration, but it will presently be shown that there are other and equally serious objections to its use even when filtered, for filtration will not certainly remove the organisms which produce Typhoid Fever and other Zymotic diseases, and furthermore, filtration of the water from the Schuylkill River is not a practicable operation continuously.

CHARLES M. CRESSON, M. D.

413 Locust Street,
Philadelphia, May 31st, 1889.

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# Extracts from Memoranda made by Dr. Charles M. Cresson Relative to Water Supply and Disease in the City of Philadelphia.

**The present communication refers to the relation of Water Supply to Typhoid Fever.**

## II

The damaging effect of substituting a water supply which uninterruptedly carries the material which produces Typhoid Fever for one that carries it interruptedly and occasionally, is shown in the records of deaths from Typhoid Fever in the Sixteenth, Seventeenth, Eighteenth, and Nineteenth Wards of this city.

The water of the Delaware River opposite to and for some distance above the city of Philadelphia is never free from the dejecta of Typhoid patients, whilst that of the Schuylkill, either when the river has been thoroughly swept out by a strong freshet, or has been quietly flowing at its normal slow rate of two to three miles a day, is comparatively free from the material referred to; this freedom however is disturbed to a greater or less degree by the greater or less flow caused by rainstorms which transfer sedimentary matters from the upper to the lower ends of the pools of the dams, or the contents of one pool into another.

During the year 1888, the four wards referred to were supplied with water from the Delaware River, and the annual death rate in each million of inhabitants from Typhoid Fever was 1362.

During the first three months of the year 1889, the water was supplied from the Schuylkill River and the annual death rate was 342.

During the eleven weeks from April 1st to June 15th, the water supplied was a mixture of that from both the Schuylkill and the Delaware Rivers, and the annual death rate was 957.

From this it appears that the substitution of water from the Schuylkill River was followed by a decided fall in the death rate from Typhoid Fever, and that the injection into the water supply from the Schuylkill, of a proportion of water from the

Delaware River, has added materially to the death rate of the district so supplied. The substitution of a mixture of the waters of both rivers for that of the Schuylkill *alone, has been extended to other sections of the city and with similar results* as to the production of disease.

Daily analyses have been made of the waters supplied to several districts of the city in order to ascertain from what sources they were obtained.

Some idea can be had of the proportions of water supplied from each river from the results of daily analyses made of water drawn from a hydrant in one of the four wards referred to.

The following is from the record of analysis for succeeding days in the month of May—$\frac{1}{5}$ Delaware, $\frac{1}{2}$ Delaware, $\frac{1}{2}$ Delaware, $\frac{1}{3}$ Delaware, $\frac{1}{2}$ Delaware, All Schuylkill, All Schuylkill, $\frac{1}{4}$ Delaware, $\frac{1}{2}$ Delaware, $\frac{1}{4}$ Delaware, &c. In another one of the four wards the supply was occasionally all Delaware water, but was generally from the Schuylkill River with varying fractional parts, such as $\frac{1}{5}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, &c. from the Delaware.

When we consider that the most objectionable material in sewage is solid and insoluble in water, and that dilution with water does not destroy, or even lessen, its destructive agency, but simply spreads it throughout a larger amount of vehicle, then it is evident that the policy of mixing a badly contaminated water with one of better quality is calculated to promote the spread of an epidemic.

In one of the reports of the commissioners appointed to inquire into the best means of preventing the pollution of rivers in Great Britain, is an account of the results of the substitution of a bad water supply for a fair one. A severe outbreak of Typhoid Fever occurred in Guilford, within an area which nearly coincided with a particular section of the public water supply. It was shown that about ten days before the outbreak 330 out of 1675 houses had *exceptionally* received their water from a service reservoir which had been filled from a new well sunk in the lowest part of the town and close to several sewers, the brick work of which was so defective as to allow the sewage to flow into the well. "*The persons residing in or frequenting these 330 houses constituted the part of the population on which the epidemic influence had almost exclusively fallen.*" The water from the new well had been pumped on or before August 1st, and had been stored in a reservoir until August 17th, when it was distributed. "It was distributed on no other day and to no other houses." "These

330 houses, therefore, on which the fever almost exclusively fell had received a different water from the other houses of the town, viz.—water from the new well, stored up from August 1st, and delivered on August 17th." Great numbers of similar cases of the poisoning of communities by the contamination of a water supply with the discharges from the stomachs and bowels of Cholera and Typhoid patients are given by the same authority.

The water of the Delaware River, which daily receives the evacuations of probably 700,000 individuals, that is, over 1,000,000 pounds of excremental matter, constantly gives evidence of its presence. The soluble matter, after vibrating up and down the stream with the changes of tide, is finally carried *down* the river to the ocean, whilst the solid insoluble fecal matter which carries the dangerous element, and is slightly heavier than water, is transported *up stream* and a little further by each flood tide and is meanwhile deposited between the times of transport, upon the bottom and banks of the river, until its substance is finally converted into soluble matter, and thus carried off by the flowing waters of the stream, or into gases which escape through the air.

It is this peculiar action and effect of the flood tide which daily carries more and more fecal matter up the Delaware that produces the continual and increasing depreciation of quality evident in the water pumped from the river at Lardner's Point.

For some, as yet undetermined reason, the water pumped from the river at Lardner's Point has recently been enormously depreciated, so as to develop results far exceeding in degree the normal increase of the past eight years. The annual death rate in the million inhabitants from Typhoid Fever in the districts supplied with water from this location has been, for,

| | |
|---|---|
| 1880 | 575. |
| 1883 | 689. |
| 1886 | 792. |
| 1889 (January to June) | 1,389. |

The marine works placed in the Delaware River for the purpose of changing the direction of the current, have probably contributed to the deposition of sewage solids in greater quantity than heretofore in the locality of the inlet to the Lardner's Point pumping station, whereby the water when taken for city use has been contaminated to a greater degree.

The fact that in tidal rivers solid matters slightly heavier than water, are carried up stream and there deposited, was fully

investigated in England by a Commission appointed to report in relation to the proper location for the outfalls from the new London Sewage System. This report states "It appears that at whatever point of a tidal river sewage may be discharged, the solid matters will again work their way up the stream, and deposit on the banks for speedy decomposition."

This is simply due to the greater power of the rising (flood) tide water over the ebb, in conveying deposits of but little specific gravity.

This state of facts explains why towns upon the river Delaware which take their water supply from the river below this city are less affected by Typhoid Fever, from the city sewage, than are the inhabitants of the city itself, who obtain their water supply from the same river a few miles *above* the sewage outlets.

The conditions of the transfer of sewage in rivers which have *no tidal current*, and in those of *interrupted or intermittent current*, like the Schuylkill River, are very different from those of the transfer in tidal rivers.

The effect of water supply upon other diseases than Typhoid Fever, and the general health rate of many cities *from all causes*, have been investigated.

It has frequently been asserted that the record of general health of cities places Philadelphia in the first rank for healthfulness of the larger cities, excepting only London, England.

This statement is not correct, for careful comparison of the death rates of over 50 cities shows that the general death rate of Philadelphia from all diseases is far greater than that of many other large cities upon this continent and elsewhere.

Whatever superiority the relative standing of Philadelphia for healthfulness in comparison with other cities may have been, years ago, it has now been lost by the failure of the municipality to provide for sanitary improvements in proportion to the rapid increase of population.

Other cities have taken the lead in the adoption of measures calculated to improve the health of their inhabitants, and in most instances decidedly improved results have been secured by the prompt, energetic, and efficient action of the authorities in the improvement of the quality of the public water supply.

CHARLES M. CRESSON, M. D.

413 Locust Street,
Philadelphia, June 25th, 1889.

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# Extracts from Memoranda made by Dr. Charles M. Cresson Relative to Water Supply and Disease in the City of Philadelphia.

**My previous communications, numbered I. and II., referred to the relation of Water Supply to Typhoid Fever only.**

## III

The records of the Health Department show that during the epidemic of another Zymotic Disease, to wit, Cholera, those wards which were supplied with water from the Delaware River were most scourged.

In 1866 there were 910 deaths from Cholera in the whole city; of this number 301, or nearly one-third occurred, in the Seventeenth, Eighteenth, and Nineteenth Wards, which wards then received their whole city supply of water from the Delaware River. The population of these three wards was one-seventh the total population of the city.

In the year 1862 a report was made by the Health Board as to the bad character of the Delaware water supplied to these wards, and it contained the following words: "All things considered, (the water) is a sanitary evil of so dangerous a nature to the health of the inhabitants of those wards through which it is distributed as to demand at the hands of Councils its immediate disuse."

Notwithstanding these positive statements, which were formally included in an official report to the City Councils, the municipal authorities have continued to furnish the same polluted water supply, and after a lapse of twenty-seven years this now much worse polluted water, mixed with that of the Schuylkill River, has been sent into nearly every ward of the city of Philadelphia, thereby spreading the area of active sickness from Typhoid Fever.

If in 1862 measures had been promptly taken to exclude the water of the Delaware River from the Sixteenth, Seventeenth, Eighteenth, and Nineteenth Wards, substituting that from the Schuylkill River, the number of deaths from Typhoid Fever

alone in these wards would have been reduced from 2976 to 1500, a saving of over 1400 lives. If, at the same time, such measures had been taken as would have reduced the death rate, from Typhoid Fever, in the whole city, to that of the present rate of the city of London, England, a saving of 10,236 lives could have been made.

The great danger from Typhoid Fever and Cholera, through the medium of the water supply, does not come primarily from the carriage of decaying animal matter, but from the influx of water-closet drainages. Personal examination, which detects the presence of channels of communication with cesspools and water-closets, is a far better detective in the determination of the fact that water supply is dangerous, than are the results of chemical analysis or biological examination. A water, which, from the results of chemical analysis, is classed as good or fair and fit for household use, may carry the germs of Typhoid Fever or of Cholera with fatal effect consequent upon the presence of minute amounts of cesspool or water-closet drainages containing the germs of those diseases. Water containing cesspool drainages should be absolutely rejected for drinking purposes.

An alkaline condition of the water is necessary for the preservation of the Typhoid Fever or the Cholera germs; the waters of the Delaware and Schuylkill Rivers for miles above the city of Philadelphia are always in an alkaline condition in consequence of the presence of decaying animal matter.

Natural waters which have not received animal matter are normally in an acid condition, and this acid condition contributes to the destruction of the germs of Typhoid Fever and Cholera, if they should be introduced.

When water carries a considerable amount of decaying animal matter it is unfit for household use, for the reason that other fatal diseases of the intestinal tract may be produced, although there may be an absence of Typhoid Fever or Cholera germs.

Careful comparison of the death records with the conditions of our water supply (as to the amount of soluble organic matter and of organisms, both animal and vegetable, which are carried by the waters of the two rivers from which our supply is taken) shows that another class of diseases, tabulated in the records of the Health Department as "Inflammation of the Stomach and Bowels," is intimately connected with the condition of the water supply, and that these diseases are quite as fatal as Typhoid Fever.

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The relative number of deaths from Typhoid Fever and from the other diseases referred to is shown in the following tables:—

| | Deaths from Typhoid Fever. | Deaths from Inflammation of Stomach and Bowels. |
|---|---|---|
| 1885 | 610 | 578 |
| 1886 | 618 | 631 |
| 1887 | 621 | 740 |
| 1888 | 785 | 754 |
| | 2,634 | 2,703 |

This second class of diseases is chargeable to the carriage of much decaying and decayable animal matter. The effect of the pollution is promoted and aided materially by the presence and carriage of millions of diatoms, the nurseries for which organisms are found in the Schuylkill River, in the numerous pools formed by the dams built at frequent intervals along the course of the stream. Some idea of the number of these diatoms that are occasionally present in the water can be had from the fact that from fifteen to twenty of them have been frequently counted in one drop of water drawn from a house faucet, and this crop of diatoms is in addition to the thousands of living organisms which frequent polluted and stagnant water, and which are often common in the Schuylkill River.

The number of deaths returned from this class of diseases for the six months ending June 30th, 1889, was:—

| | |
|---|---|
| Typhoid Fever | 354 |
| Inflammation Stomach and Bowels | 310 |

a total of 664 deaths in six months, or at the rate of 1328 annually, from two classes of diseases which are largely connected with a polluted water supply.

Comments made in the Report of the Rivers Pollution Commission of Great Britain in relation to the evident connection between disease and water supply in England, are equally applicable to our own city of Philadelphia. The effects of two zymotic diseases only have been referred to, "but evidence is not wanting to show that other scourges, such as Dysentery and Diarrhœa, are probably propagated by water which has received the excrements of patients suffering from those diseases. It is humiliating to reflect on the vast amount of premature death and misery thus carelessly permitted to exist in the midst of a civilized community. In England and Wales alone the average yearly number of deaths from zymotic poisons is 120,000, representing a total number of cases of more or less intense

suffering, which is certainly not overestimated at 1,200,000. But even this enormous number only includes the persons actually poisoned, it takes no cognizance of the misery of families reduced to pauperism or worse, by the death or long illness of those upon whom they are dependent for support. We have heard excuses for the continuation of this frightful mortality on the ground that these diseases attack and carry off the weakly and unhealthy portion of the population, and thus improve the general strength and vigor of the race. We have been unable to find any confirmation of this theory, so far, at least, as the two diseases of which we are writing are concerned. There appears to be no connection whatever between weakness of constitution and susceptibility to Cholera and Typhoid Fever; the robust and the delicate—the prince and the peasant—are alike the victims of these poisons; and there is not, as yet, any satisfactory proof even that the percentage of fatal cases in those attacked is greater amongst the weak than it is amongst the strong. The means for preventing much of this death and torture are now well known and capable of practical application.

"Their neglect really signifies the destruction of the people by parasitic organisms, which we have the means, but not the will, to exterminate; and it will not much longer be regarded as involving less national disgrace than would attach to the annual loss and mutilation of vast numbers of our population by beasts of prey which we were too apathetic to destroy."

When we consider that from two diseases only, Philadelphia has, since the action and recommendation of the Board of Health in 1862 in relation to the necessity for a change in the source of its water supply, lost by death not less than 20,000 of its inhabitants by the use of impure and polluted water, the comments quoted are not too severe, remembering at the same time that the many efforts which have been made to effect a change have been frustrated by the authorities, and not by the citizens. The citizens have, however, neglected to insist upon pledges from their representatives in Council that they will do something to remedy the evil. Otherwise nothing remains but to obtain such legislative action as will, by the subjection of personal responsibility, render legal intervention by the courts prompt and effective in the compulsion of measures of relief hitherto denied by the action of the authorities.

CHARLES M. CRESSON, M. D.

413 Locust Street,
Philadelphia, July 9th, 1889.

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# Extracts from Memoranda made by Dr. Charles M. Cresson Relative to Water Supply and Disease in the City of Philadelphia.

## Filtering Schuylkill Water.

### IV

There is no doubt that a great improvement can be made in the quality of the water from the Schuylkill River by the use of settling basins and filtration, and that many lives which would otherwise be lost, can be saved by the use of suitable filtering devices properly cared for.

Settling and filtration should then be made use of for the protection of the citizens *pending the construction of works to obtain a good water free from the pollution of "excreta."*

In London, England, the removal of the "intakes" of the pumping stations upon the Thames to locations many miles above London Bridge, the use of enormous settling basins and filter beds, and, as far as practicable, covering the storage reservoirs, and obtaining a portion of the supply from deep artesian wells, have effected an improvement in quality, which has materially aided in reducing the death rate from Typhoid Fever alone from 337 in the million of inhabitants in 1868 to 145 in 1887.

It is proposed to erect aqueducts leading to London from distant points, where water free from all sewage containing excremental matters can be obtained, and to substitute this better water supply for that which is now supplied from the Thames and neighboring rivers.

Neither settling nor filtration by any practicable method will certainly remove the organisms which carry Typhoid Fever and Cholera, nor those which promote inflammation of the intestinal tract, nor the soluble decaying and noxious matters which are carried by the Schuylkill River water.

The cost of settling basins and filter beds or like apparatus may be set down *as a part of the price for the delay* of the author-

ities in not taking the prompt action so often asked for during the past twenty years.

A reduction of the death rate from Typhoid Fever alone from an annual rate of say 607 in the million of inhabitants in the best district, to say 200 to the million, in the course of two or three years' time, would warrant any reasonable amount of expenditure for basins and filters.

The values of many sorts of filters employing various filtering media when used for treating Schuylkill water have been determined by continuous trials extending over many months and with some of them over much longer periods.

The physical characteristics of the water of the Schuylkill River have been much changed during the past ten years. There has been a rapidly increasing growth of organisms which periodically affect the flow of the water through filtering media. Reference is made especially to a growth of gelatinous material, which at times is carried in enormous amount. When the stage of water in the river is such that there is but a small amount or no water flowing over the score or more of dams which form as many almost stagnant pools in its course, the growth of these organisms is greatly promoted.

The water in each pool becomes a culture medium or nursery, in which the soluble drainages containing animal matter, especially urine, aid in the propagation, preservation and accumulation of bacteria. In fact, scientists sometimes employ liquids containing urine as a culture fluid, as being well suited for the development of many species of bacteria.

The peculiar organisms to which reference is particularly made consist of jelly-like matter, tinged brown by the presence of a small amount of iron.

When these masses are carried down the river by storm waters they give to the water a brown color, much resembling that produced by the carriage of earthy matter, often giving credit to the water for "muddy" condition, when, in fact, but a small amount of mineral sedimentary matter is present.

The odor of decaying animal matter which comes from the brown "mud" which settles in the reservoirs, is often derived from the decay of these gelatinous masses, and one result of their decay is the partial conversion of their substance into soluble matter which adds to the harmful contamination in the water, and materially to its unwholesomeness.

The removal, by means of filtration, of the suspended mineral

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and vegetable matter from water which is to be used for household purposes, is undoubtedly a great improvement, not only in appearance but in quality, as it separates solid decaying and decayable substances from the water, and in this way the general wholesomeness of the water may be improved. As to the "germs of disease," however, I have found but one filtering device which will effect their removal, and that device is the Pasteur-Chamberlain Filter.

If it were possible to force a sufficient amount of Schuylkill water through filters made from the dense yet porous clay of which this filter is constructed, the offensive mineral and vegetable solids and bacteria, including those which communicate Typhoid Fever and Cholera, could be excluded from the water supply, but, unfortunately, the gelatinous material carried periodically by the water soon clogs the pores of this filtering material and actually forms an adherent varnish upon the surface of the filter tube, which coating bars the passage of the water completely and makes necessary a thorough cleaning of the surface of the filter at frequent intervals, sometimes as often as once in an hour.

But even the Pasteur-Chamberlain Filter, the use of which for the filtration of a large volume of water is prohibited by the enormous cost for filters and the labor necessary to keep them in working order, fails to arrest the soluble hurtful matter upon which the unwholesomeness of the water largely depends.

With every filter that has been under trial the gelatinous matter referred to has been retained in the filtering material, finally clogging the pores, and decaying at the expense of the air in the water or the decomposition of the nitrates, the result being either a stoppage of the current of water or an increase in the amount of soluble deleterious matter; in fact, at times rendering the filtered water, although it had been rendered clear, transparent, and colorless, by filtration, far more unwholesome than the unfiltered water.

This extensive carriage of decaying gelatinous solid growths is peculiar to rivers which have no tidal flow, and of which the current is interrupted by dams into which cesspool drainages are permitted to flow.

Among the filters tested were those using sand, gravel, charcoal, animal charcoal, oxide of iron, and plates of porous stone or earthenware, as filtering media, as well as those combining chemical treatment with filtration. The result showed that the

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water of the Schuylkill could be rendered clear by the removal of solid suspended or floating material and sedimentary matters, excepting whenever the river carried the gelatinous matter to which reference has been made, when every sort of filter become more or less clogged, and required frequent cleansing; the most efficient filter, requiring the closest attention, the Pasteur-Chamberlain, sometimes needing cleansing after use for one hour's time. None of the filters removed from the water any appreciable soluble deleterious matter, and none, except the Pasteur-Chamberlain, removed the organisms which indicate Typhoid contamination.

If the experience obtained in London warrants the substitution of expensive aqueducts and the conveyance of an unpolluted water from a great distance, for costly, well-constructed subsiding and filtering plant, thus reducing the annual death-rate from Typhoid Fever alone from 337 to less than 150 in the million of inhabitants, should not the City of Philadelphia, with a death-rate from the same disease of over 600 deaths in the million, in its best supplied district, promptly set to work to do that which the carefully kept records of other large cities show to be a necessity, to wit, *the abandonment of a polluted water supply as soon as practicable and the substitution of one free from filthy and dangerous cesspool contamination?*

CHARLES M. CRESSON, M. D.

413 Locust Street,
Philadelphia, September 3d, 1889.

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# Extracts from Memoranda made by Dr. Charles M. Cresson Relative to Water Supply and Disease in the City of Philadelphia.

## Settling and Filtering Drinking Water.

V

Whenever it is proposed to treat the water from the Schuylkill River by any specific method for the purpose of improving its quality, commercial prudence suggests that inquiry be made as to the cost and results obtained by the use of similar methods of treatment elsewhere, so as to ascertain whether or not the proposed method will in any way compensate for the expenditure.

Fortunately for our purposes all of the necessary data for ascertaining the facts can be had by a careful examination of the results obtained in London from subsiding and filtering plants, erected upon a scale involving millions of dollars of outlay, and recorded by a royal commission.

Although the major part of the water supplied to London is settled and filtered, and great care and strict police surveillance are exercised in order to exclude improper drainages, yet a reduction only is made in the death rate of the diseases chargeable to water pollution, and there is not a practical extinction of the disease, as was the case in reference to Cholera, in the substitution of an unpolluted water supply for a polluted one in the city of Glasgow.

The results of the epidemics of Cholera were as follows:—

London.

| | | |
|---|---|---|
| 1849, deaths per 10,000 | 61.8. | Very much polluted water. |
| 1854, " " | 42.9. | Less polluted. |
| 1866, " " | 16.4. | Much less polluted. |

Glasgow.

| | | |
|---|---|---|
| 1849, deaths per 10,000 | 106.0. | Polluted water. |
| 1854, " " | 119.0. | " " |
| 1866, " " | 1.6. | Unpolluted water. |

In 1859 the pure water of Loch Katrine was introduced as a water supply in place of that from the river Clyde, which accounts for the practical extinguishment of the epidemic Cholera,

as shown by the reduction in the death rate from 119 to less than 2 individuals in each 10,000 inhabitants.

The incomplete results of settling and filtration combined have been recognized by the local authorities of London, and surveys have been made in order to ascertain the feasibility and cost of bringing pure water from great distances to London. One proposed source of supply being the head-waters of the Severn River, and another the lakes in the mountains of Wales, either source being so situated as to render it easy to prevent the influx of pernicious pollution.

There is a great resemblance between the surroundings of the Thames River in England and those of our own Schuylkill River, so far as relates to the drainage basins, the conditions governing the variations in flow, the sources and sorts of pollution, and the operations of the changes of weather upon the flow and quality of the water; and the parallelism of the conditions is easily observed by a perusal of the following recorded facts:—

The organic pollution of the Thames, already polluted by dangerous cesspool drainages, is enormously increased by heavy floods. Not only do heavy floods bring down a vast quantity of filthy organic matter, but in dry weather a thunder shower, for instance, will suddenly wash into the river or its tributaries the polluting matters which have been accumulating for weeks in cesspools and stagnant ditches, without increasing the flow of the river to any great extent; in this way a very small flood upon a low river will sometimes impart to the river a greatly increased proportion of organic impurity.

Independently of floods, however, the decay of vegetation late in the autumn always produces a well-marked change for the worse in river waters. Even a small flood at this time of year or soon after "the fall of the leaf" produces a great depreciating effect upon the quality of the water.

Enormous reservoirs which give great storage capacity enable an avoidance of the worst effect of floods, but on the subsidence of floods it occasionally happens that the quality of the water distributed is, *notwithstanding filtration, inferior to that found in the river*. In reference to the question of the storage of the Thames water, it is noted that whilst fifteen or twenty days' storage capacity properly worked will enable the water companies to reject flood water in spring or summer, nothing less than eighty or ninety days' storage will render them independent of flood water in autumn or winter.

The London Water Company, which in 1874 supplied the water of the best quality, sent out about 21,000,000 gallons daily to a district inhabited by about 700,000 people, and employed in the treatment of the water 8 subsiding reservoirs of 220 acres in extent, and holding 482,000,000 U. S. gallons of water. After prolonged subsidence in the reservoirs the water was passed through filters composed of 18 inches of fine sand and 24 inches of coarse and fine gravel, arranged in 19 acres of filter bed. The 70,000,000 gallons of water daily supplied to Philadelphia would require 1,600,000,000 gallons of subsiding reservoirs to be in proportionate capacity with that employed by the London company. The proportionate area of filter beds required to perform a similar amount of work for the Philadelphia water supply would cover over 63 acres of ground, or a space about eight times that occupied by Logan or Rittenhouse Square.

The maintenance of the filter beds will add considerably to the cost of the water ready for distribution, for the reason that the surface of the beds must be cleansed frequently, for Schuylkill generally once in two weeks, but occasionally daily. Reserve beds are, of course, necessary to take the place of those being cleansed. Other devices than the ordinary filter beds may be used, but with any given fineness of material the efficiency of filtration is inversely to the rate of flow. Filter beds constructed of very fine material give close and small interstitial spaces, but the head or power necessary to force the water through them is materially greater than that required for coarser beds, such as fine gravel or sand, and the cost of filtration is more than proportionately increased. The test of the efficiency of a filter so far as relates to the prevention of disease, depends, not upon the number of organisms that it separates from the water but upon how many of the dangerous sort it permits to pass through. The removal of a thousand harmless organisms cannot compensate for the passage of one organism that may carry fatal disease. Unfortunately the dangerous ones are of very small dimensions and the filter which will certainly exclude them has its pores so small that filtration on a large scale seems to be impracticable. (See comments in Communication No. IV. in relation to the Pasteur Filter.)

The obvious use of storage reservoirs, which are employed by the water companies, is to preserve the water when in good condition for use when the water is in flood; but it is equally obvious that if, owing to a prolonged flood, water of bad quality is

admitted into the reservoirs means ought to be provided for the return of that water to the river as soon as the latter becomes of superior quality to the impounded water.

It is hopeless to try to prevent the admixture of disgusting matters with the water of any river running through a cultivated and populous district. The waters from such a river may, by the adoption of the remedies usually employed for removing pollution, be rescued from unsightly and unsavory foulness, *but it can never be rendered a safe source of water for domestic use.*

Filtration may render turbid waters bright and transparent, but *it cannot remove the soluble filth* with which they are polluted.

The following deductions made in relation to the water supply from the Thames are equally applicable to that of the Schuylkill River:—

1. The river receives the sewage from a large number of towns and other inhabited places, the washings of a large area of highly-cultivated land, and filthy discharges from many industrial processes and manufactures.

2. It is the common water-way for a large amount of polluting matter, much of which is dangerous to the health of communities using the water for domestic purposes.

3. The water is, nevertheless, when efficiently filtered, free from any offensive taste and odor.

4. There is no hope of this disgusting state of the river being so far remedied as to preclude the presence of animal and other offensive matters, *even in the filtered water.*

5. *The river should, therefore, as early as possible be abandoned as a source of supply for water for domestic use.*

The Rivers Pollution Commission of England publish the following pertinent opinion: "We desire it to be distinctly understood that although *this purification* of water polluted by human excrements may reasonably be considered, on theoretical grounds, to be some safeguard against the propagation of epidemic diseases, *there is not in the form of actual experience a tittle of trustworthy evidence to support such a view.* On the contrary, the investigation of Typhoid Fever at Lausanne, in Switzerland, proves that *very efficient filtration does not prevent the propagation of fever by water. Nothing short of the abandonment of the inexpressibly nasty habit of mixing human excrements with our drinking water can confer upon us an immunity from the propagation of epidemics through the medium of potable water.*"

CHARLES M. CRESSON, M. D.

413 Locust Street,
Philadelphia, September 16th, 1889.

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# ON THE PRESENT CONDITION OF THE PHILADELPHIA WATER SUPPLY. THIRD MONTHLY REPORT.

By SAMUEL C. HOOKER, Ph.D.

[*Read at the Stated Meeting of the Chemical Section, June 18, 1889.*]

In my last report presented to the Section a month ago, I recommended that the Kensington pumping station be dismantled. I did not, however, deal with the Kensington supply as fully as I now propose to do, as there appeared to be a reasonable hope that this station would only be resorted to, in the immediate future, in the event of an unexpected break-down occurring at one or other of the stations on the Schuylkill.

This hope, which was based upon statements emanating from the Department of Public Works, has, however, been shattered during the past month, and the importance of the subject is so great that I feel I cannot do better than devote this report entirely to its consideration.

I wish it, at the outset, to be distinctly understood that whatever is said in this report refers exclusively to the water drawn from the Delaware at the Kensington station, and does not have any bearing whatever upon the city supply as a whole. While I shall presently speak strongly against the water pumped at the Kensington Works, the experience of the past month has strengthened the fairly favorable conclusion to which I had previously come, regarding the actual quality, aside from muddiness, of the Schuylkill water, which, as is well known, forms the bulk of the city supply.

The Kensington district is at present supplied from the Delaware at Kensington, from the Delaware at Lardner's Point, and from the Schuylkill.

Two thirty-inch mains, the one conveying water from the Wentz Farm reservoir, the other from the Schuylkill, make connection with the Lehigh basin, which supplies the dis-

trict. The Kensington pump also discharges into the Lehigh basin.

In spite of all efforts which can be made by the Water Department, under existing circumstances, the water carried through the two mains just referred to, from the Schuylkill and from the Wentz Farm basin, is not sufficient for the requirements of the neighborhood, and consequently the level in the Lehigh basin gradually sinks, pressure diminishes, and finally complaints of short supply reach officers of the Department. Nothing remains but to start up the pump at Kensington, and to continue drawing water from the Delaware until the reservoir is again filled. I thoroughly believe that the necessity of abandoning the Kensington station is fully realized by the Chief Engineer of the Water Department, but he is powerless to cause this to be done until some adequate provision is made for meeting the requirements of the district.

The bulk of the water drawn at the Kensington Works is supplied to the sixteenth, seventeenth, eighteenth, nineteenth and thirty-first wards. This district, as is well known, is the unhealthiest portion of the city. That the water is in a great measure responsible, there can be no doubt; to say that it is entirely responsible, would unquestionably be stating the case too strongly.

It is proposed to carry a forty-eight-inch main from the Schuylkill, in place of the thirty-inch main now existing, but this cannot be done without money, and until the sum necessary for this purpose is appropriated, pumping from the Delaware at Kensington must continue to a greater or less extent.

For years past the money which has been placed at the disposal of the Department has been very far short of that required for its imperative needs, and this state of affairs promises to continue unless some action is taken by the general public in asserting its rights and insisting that they shall be respected.

Whatever difference of opinion may exist regarding the wholesomeness of the Schuylkill, there is absolutely none possible regarding that of the Delaware at Kensington, and it

cannot be too strongly insisted that this foul, sewage-polluted water shall be no longer used for city supply, even though its poisonous and filthy character is partially or entirely disguised by admixture with large volumes of water from the Schuylkill and from Lardner's Point.

It is simply impossible for the sewage discharged into the Delaware, in the neighborhood of the Kensington Works, to be in any degree purified before it is taken up by the pump and distributed to the helpless population of the sixteenth, seventeenth, eighteenth, nineteenth and thirty-first wards. What wonder, then, that the Kensington district is a very hot-bed of disease in this city!

For nearly thirty years, this water from the Delaware at Kensington has been repeatedly condemned as *unfit for use* by Health Boards, by the engineers of the Water Department, by the experts who have examined into the matter, by every one, in fact, whose scientific knowledge has been sufficient to enable a clear estimate to be formed of the danger of supplying this sewage-saturated water to the community. Common sense rebels against it, the records of the Health Office silently protest against it, and yet for thirty years this pumping from the Delaware at Kensington, from a station which ought never to have been established, has been continued.

For a great number of years it has been the purpose of the various administrations of the city to abandon the Kensington Works, and it may be well to inquire how it happens that in spite of such good intentions these works still exist. The recommendations suggested by the various engineers of the Water Department, if carried out promptly at the time they were made, unquestionably would have enabled the Kensington station to fall into disuse, but unfortunately they were allowed to remain so long unacted upon, that when finally put into effect, instead of being able to supplant the Delaware supply for which they were originally devised, they were only able to meet the additional requirements of the district, due to its growth in the meantime.

It has been argued that the quantity of water pumped at

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Kensington is insignificantly small compared with the total supply of the city. So much the better; but instead of being a good reason for the water to be tolerated, it makes substitution of better water all the easier, and therefore all the more to be insisted upon.

Let me now refer to a few extracts from the reports of the Board of Health. The first is taken from the report for the year 1862, p. 13:

"One of the most serious and aggravated nuisances which "has attracted the attention of the Board was the water "supplied by the Kensington Works. After a careful "investigation, based upon personal observation, as well as "the experience of several physicians practising, and the "analysis of a practical chemist, the Board, in May last, "declared the water therefrom furnished to be a nuisance, "prejudicial to public health, and so notified Councils. "* * * *We are of the opinion that the only permanent remedy "will be the total abandonment of the Kensington Works."*

In the report of the Board of Health for 1866, p. 10, occurs the following:

"*All things considered the water is a sanitary evil of so "dangerous a nature to the health of the inhabitants of those wards "through which it is distributed, as to demand at the hands of "Councils its immediate disuse.*" (The Chief Engineer, after an allusion to the alterations since made, says: "*I regard it as "certain that the supplying of pure, or in any considerable degree "suitable, water, for domestic purposes, from the river Delaware at "the location of the Kensington Water Works, is impossible.*")

"Notwithstanding the improvement in the induction pas- "sage from the river to the pumps there has been no "improvement in the water itself, nor can there ever be whilst "the present supply of Kensington water is derived from the "river Delaware at the present location. It will be evident "to every disinterested visitor to the Kensington Water "Works that a supply of pure water is impossible. The "sewers opening into the river Delaware discharge their con- "tents at a rate of an average of about 13,000,000 gallons "daily, which necessarily includes every description of

* The italics in this and in the following quotations are my own.

"impure and refuse matter from the city, and of late years "this impurity is much increased by the construction and "connection of numerous water-closets with the sewers, from "both public and private dwellings. A further deterioration "necessarily occurs from the emptying of Gunner's Run and "Cohocksink Creek into the Delaware, together with the large "amount of human and other offal deposited in the river at "Richmond. * * *

"The action of the tides, the movements of steamboats "and the general traffic on the river, keep in suspense and "carry a large portion of the impurities from the sewers "from Gunner's Run and the Cohocksink Creek far beyond "the present mouth of the induction tube at the end of the "wharf. * * * When we know from our bills of weekly "mortality that out of 277 deaths from *cholera Asiatica*, 132 "(or 47 per cent.) have occurred in those wards supplied with "the Kensington Delaware water, we think we shall be borne "out in the opinion that the prevalence of the disease in "those districts is not only occasioned by the use of the "water as a prominent cause, but that the water has so "deteriorated in quality as to make it unfit for domestic "purposes, dangerous to health and life, and therefore your "committee would declare it to be a nuisance prejudicial to "health, and would offer the following:

"*Resolved*, That the Kensington water supply as taken "from the Delaware is a nuisance prejudicial to public health, "and that Councils be urged by this Board to discontinue the "supply at the earliest practicable moment, as the only "remedy for the removal of the nuisance and the protection "of the health of the district supplied therewith."

If this was the condition of affairs nearly twenty-five years ago, with how much more force do these arguments apply at the present time, when the amount of the sewage flowing into the river Delaware in the neighborhood of the Kensington pumping station has been ever on the increase.

The following extract is taken from the report for 1871, p. 28:

"The immense quantity of filth of every description "deposited in the river from the common sewers, estimated

"at *over 13,000,000 gallons daily*, and decomposing organic "matter always floating about the wharves, which is carried "up and down the river front by the tidal currents, and con- "stantly agitated by the general traffic upon the river, must "of necessity have a deleterious effect upon the water, even "at a distance from the shore. * * * *In the opinion of this "Board, water taken from the Delaware River at any point "along the city front is totally unfit for domestic use.*"

Again, in the report of the Board of Health to the Mayor, for 1882, p. 13:

"The water pumped at the Kensington Works is unfit "for domestic use, and this station should be abandoned."

* * * "This recommendation has frequently been "made before, but it has never been heeded. It would "appear reasonable to infer that the high death rate in the "wards supplied with this water has some connection with "the fact above stated."

The following occurs in the report of the Chief Engineer, Philadelphia Water Department, for 1883, p. 45:

"The Delaware, along the city front, is the recipient "sooner or later, of the sewage refuse and street washings of "a city area occupied by a population probably exceeding "800,000. These waste matters are borne up and down by "the tides and usually pass and repass the city several times "before taking their final departure. Under these circum- "stances, whatever may be the volume of the stream, it is by "necessity polluted and is not suitable for immediate and "habitual daily use. *In especial is the vicinity of the Kensing- "ton station marked by an accumulation of the foulest materials.* "Its central position insures its getting the full benefit of "the city's sewage, and in addition the Aramingo Canal—an "open sewer of large dimensions and choked with filth—dis- "charges in its immediate vicinity. The water taken thence "is utterly unfit for human consumption."

These extracts might be indefinitely multiplied, chemical analyses might be quoted, health statistics dwelt upon —but to what purpose? The evidence I have already presented seems to me so overwhelming that it would gain nothing in force by such additional arguments.

If the arguments against the Kensington station carried only one-tenth of the weight of those actually existing, there would still be sufficient reason to require its immediate removal.

The existence of the Kensington station through the past thirty years has been a sufficient disgrace to the city. Let it be tolerated no longer. Let public opinion express itself strongly, unmistakably. Let the newspapers of this city unceasingly agitate the matter. Let the learned and other societies engage in the contest. Let individual influence be exercised. The Kensington pumping station will then exist only as a memory of the past, to be long remembered for the desolation it has wrought in many families, but not to be feared for that which it also threatens, as at the present time, in the future.

Let us not be satisfied with any half measures, for so long as the Kensington pump remains it will be liable to be put into operation at any time. The station must be completely dismantled and pumping rendered absolutely impossible in the future.

Finally, let me ask you gentlemen, who represent the most prominent of the chemists of this city, and who by your attainments and knowledge are especially qualified to give judgment on this most important subject, unanimously to recommend to the INSTITUTE the passage of the following resolution:

"That the FRANKLIN INSTITUTE most strongly condemns the use of the Delaware water at Kensington for city supply and that it urges Councils to take immediate steps to render possible the abandonment of the Kensington pumping station."

By passing this resolution without a dissenting vote, I feel that you will confer a great benefit on the city and add to the good work for which the FRANKLIN INSTITUTE has been noted in the past.

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